

PHOTON EQUIPT.



**First Class Mail**

**PHOTON, INC.**

355 MIDDLESEX AVENUE

WILMINGTON, MASS.

**FOR**

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P. O. BOX 1546

POUGHKEEPSIE, NEW YORK 12603

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## Fast Automatic Correction of Phototypesetting

Photon EDITMASTER is a high speed system for automatic merging of original and corrected paper tapes used in metallic and photographic typesetting systems. Of particular value when used with a high production phototypesetter such as the Photon 713 Textmaster, the Editmaster makes it possible to edit and correct composition easily and at high speeds.

Perfectly edited final tapes are created with heretofore unprecedented facility. Editmaster produces either six- or eight-level tapes at a rate of 110 characters per second, or about 200 newspaper lines a minute — for production runs or for tape updating between runs.

Editmaster makes corrections entirely in tape rather than in finished composition, and supersedes other tape correction methods by elimination of time consuming manual steps.

Using photoelectric tape readers, solid state circuitry, and a high speed punch, Editmaster reads an original tape and a corrected tape and then merges the desired content of these two into a third, perfect tape.

## Basic Procedure

After proofreading of hard copy the corrections are keyboarded into a short correction tape. Editmaster then automatically merges this and the original tape into a third, perfect tape which will drive the phototypesetting machine in the production run.

Five editing codes, available from key combinations on tape perforating keyboards, are punched into the correction tape and these actuate the Editmaster's correction and editing functions. The codes are *Search*, *Edit*, *Erase*, *OK*, and *Add Edit*.

This outline of steps in using the Editmaster in conjunction with Photon 713 Textmaster indicates the relative ease and simplicity with which photo-composition is edited:

1. Original tape is perforated on either a "blind" or hard copy keyboard. Operator puts in *edit codes* at beginning of each paragraph or other subdivision of copy. An edit code is simply an arbitrary combination of keystrokes to identify that portion of text it *precedes*.
2. Proof copy of information perforated in the tape may be run off by the photosetter on low cost photo paper. This printout includes the edit codes.

Note: When a hard copy keyboard has been used, the second step may be unnecessary since the keyboard hard copy may serve for proofreading. But if the tape has been perforated on a



"blind" keyboard, proof copy is generated by running it through Photon 713 Textmaster in the *proof mode*, controlled by an auxiliary switch on the control panel. This allows printout of edit codes on the extreme left hand margin of the film or paper product.

3. Copy is proofread. Author's corrections are indicated.
4. Now the correction tape is generated on a 6- to 8-level perforator keyboard. The procedure:
  - a. Operator selects the edit group where the first correction is to be made, and perforates the edit code identification for that group.
  - b. Within the selected edit group, the operator "OK's" each good line before the line where the correction is to be made. To OK a line, the operator simply actuates the "o" key.
  - c. When the line to be corrected is reached, the operator actuates the "d" key to *delete* the line, then reperforates the line correctly. If no further change is to be made in this edit group, the OK need not be keyboarded for the remaining lines. The operator proceeds directly to the next edit group where correction is needed.
  - d. If, in tape for continuous text, the change adds more words than can be absorbed in that



line, so that the following line also is disturbed, then the remaining lines of that edit group will be reperfected.

e. The above procedure is repeated until the complete correction tape has been produced.

5. Merging is accomplished by loading the original tape on the upper tape station and the correction tape on the lower tape station. When then put into operation the Editmaster automatically selects the desired parts of the two tapes, sequentially, and merges them into the final tape.

6. The new corrected tape is run through the 713 Textmaster in *normal mode*, so that the reproduced copy does not include the edit codes.

### Special Editmaster Functions

In addition to editing functions as above, Editmaster *Search Facility* allows a long tape to be searched at a speed of 500 characters per second (about 1,000 newspaper lines a minute), so as to quickly reach any edit group.

The *Add-Edit* code allows for the insertion of an entire new edit group or may be used to insert edit codes and 713 Textmaster function coding to an original tape not already having edit codes.

### Productivity Unprecedented

How can *Editmaster* in your composing room cut costs sharply?

Basically, the original and correction tapes are merged — and then the final tape produced — at a rate of 110 characters a second — about 55 feet of tape a minute. How this speed permits a typical page to be produced in less than one minute is shown by this example:

On an 8½" x 11" with two 18 pica columns there are a total of 102 lines. There are 42 ten point characters and spaces per line, and 4,205 on the page. There are 4,610 codes in the tape for the complete page.

After proofreading, 26 lines in 6 of the 8 paragraphs must be completely re-set and re-inserted in the tape due to editing changes that have occurred in the word order, affecting justification.

Editmaster production time for the final tape: Reading of control codes and deletion of 26 bad lines — 3 seconds; perforation of entire new tape — 42 seconds; total time — 45 seconds.

*Editmaster* searches tape at 500 characters per second, 9 seconds per page for pages like that in the example above, or a full 1,000-foot roll of tape in 4 minutes.

Editmaster can also duplicate an existing tape at 110 characters per second.

### Editmaster Equipment

Control panel and equipment cabinet

Two *Omni-Data* photoelectric 6- and 8-level paper tape readers

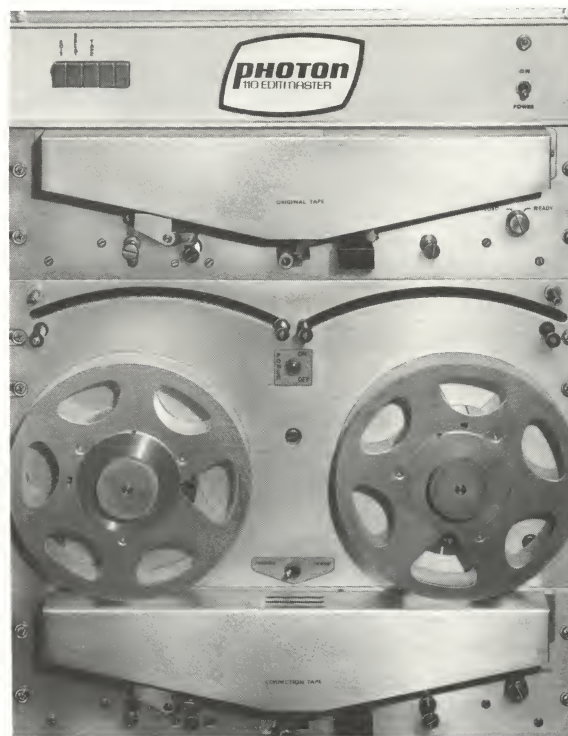
One 6- or 8-level paper tape punch (as specified)

*Omni-Data* tape handler

Electronic logic and control circuits are entirely modular solid state construction

Power supplied for punch and control circuits

Air circulator



### Specifications

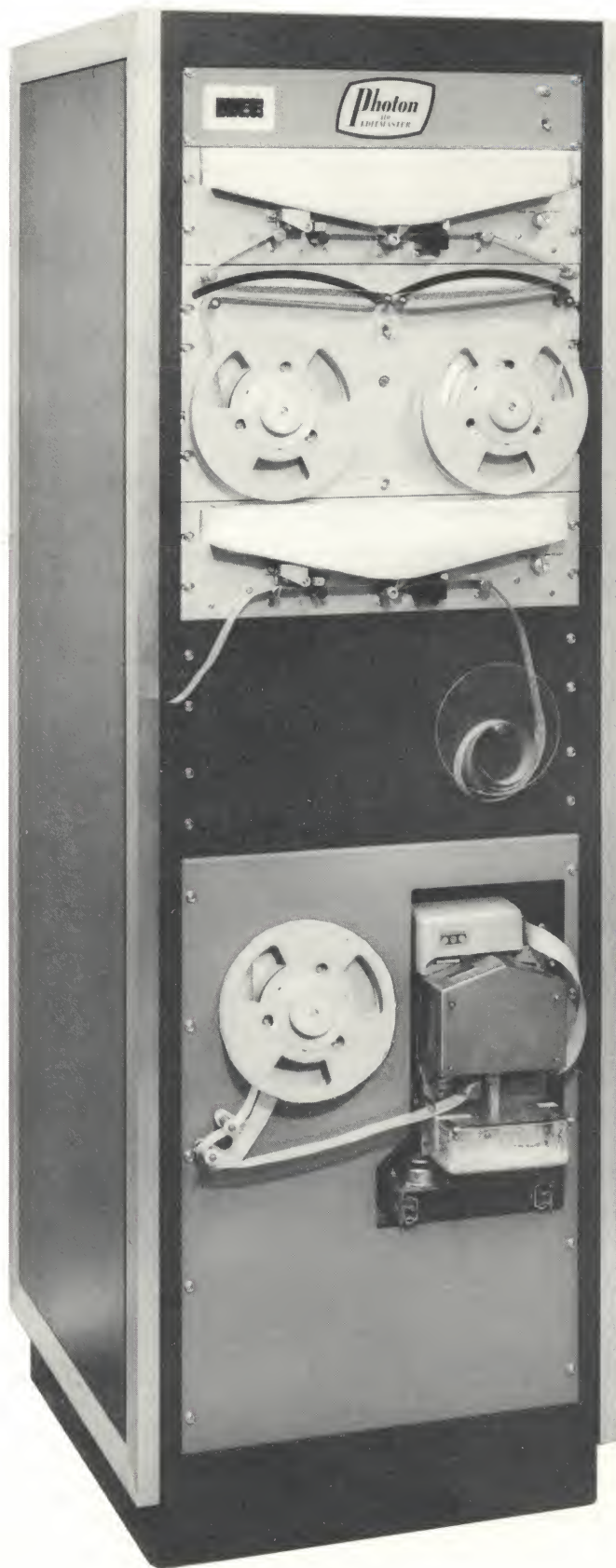
**Power:** 110 - 120 volt AC, 1000 watts

**Weight:** pounds, approximately 400#

**Dimensions:** 23½"W x 72"H x 28"D

**PHOTON, Inc.**  
WILMINGTON, MASSACHUSETTS

# PHOTON EDITMASTER 110



## **AUTOMATIC TAPE CORRECTION SYSTEM**

Proofreading, using keyboard hard copy or phototypesetter paper copy has taken place.

← **THE ORIGINAL TAPE** has been placed on the upper of three tape stations on the machine.

← **SHORT CORRECTION TAPE** seen here was quickly keyboarded; contains simply-coded changes, additions and deletions as needed.

← **PERFECT FINAL TAPE**, a merger of desired content from both above tapes is automatically produced here at 110 characters a second . . . more than 200 newspaper lines a minute.

(DETAILS ON REVERSE SIDE)

**PHOTON**  
NEWSMAKER IN PHOTOTYPESETTING

355 MIDDLESEX AVENUE  
WILMINGTON, MASSACHUSETTS



# **How PHOTON EDITMASTER Tape Merger System**

**makes corrections and changes directly in tape**

These are the simple steps:

1. **Before the original keyboarding, plot the job.** Determine its subdivision into basic "edit groups." These can be paragraphs or other obvious sections, or may be completely arbitrary groupings of 10 to 30 lines. In shorter jobs, when 26 or fewer edit groups will suffice, they are designated simply as "A" through "Z". When up to 260 groups are needed, two-digit alpha numeric designations, 0A through 9Z, are used. (Three-digit designations, 00A through 99Z can provide up to 2600 groups; but rarely would an entire 1000 foot tape hold enough lines for more than a few hundred groups.)
2. **In keyboarding (on any 6, 7, or 8 level perforators) the operator inserts a given designation such as "A", at the beginning of that group,** via two simple keystrokes—a function stroke (for "Edit") and "A". On the keyboard typescript only the "A" appears, flush left; and the text begins on the following line.
3. **Proofreading and mark-up are done,** using either the keyboard typescript or low-cost, phototypesetting paper proofs produced by a high speed 713 run, in "Proof" mode. When used in this way the 713 will reproduce the "A" designation in the left margin of the copy, on the same level as the first line of the group.
4. **Needed changes are now keyboarded into a short correction tape.** The letter designating a given group is keyboarded just as before, then "o" (for OK) is struck once for each good line in that group preceding the bad line. The "d" (for Delete) is next struck, then the new wording is keyboarded. Remaining good lines in the group require no attention nor keystrokes. From the last line involving a change the operator goes directly to the next group in which a change is needed. Whole groups as well as lines are freely skipped over. Increases or decreases in lines within a group pose no problem either, since lines are not individually numbered or designated.
5. **Placing the Editmaster in operation,** the original tape is loaded at the machine's upper reader station and the short correction tape at the mid station. Photoelectrically reading these tapes, the Editmaster electronically merges the desired content of both to produce, at the bottom station, the final perfect tape.

## **EDITMASTER SPEEDS**

**Perforates new tape at 110 characters a second**

—or 200 plus newspaper lines a minute

—or 140 plus telephone directory lines a minute

—or 100 plus book lines a minute

The Photon 200B Admaster is an advanced photographic typesetting system especially designed for high-speed production of newspaper display advertising and other matter calling for exceptional typographic versatility. The 200B has evolved from Photon's historic models 100 and 200A, world leaders of the nineteen fifties and early sixties.

The 200B has quickly become the world's most widely-used phototypesetter in newspaper ad production. In other complex typesetting, too, its acceptance has been rapid. Great typographic versatility, high productivity, unprecedented stability and reliability — all are factors that spell fast return on investment, and that have made this machine the industry standard.



### Direct operation

Photon 200B produces complete copy-block typesetting directly from the typewriter keyboard, without tape interjection.

The operator fulfills detailed, complete typesetting assignments, employing automatic controls to produce typographic formats of any degree of complexity.

The typewriter and the contiguous controls provide command over every job element. The operator selects and mixes 192 type fonts without delays or calculation and with complete freedom. All function and spacing controls are automatic. All are available at the mere touch of a button.

When a key is struck its code is stored in a memory unit of the machine. Not until the line is complete and acceptable to the operator will any part of it be passed through to the optical system and actually typeset.

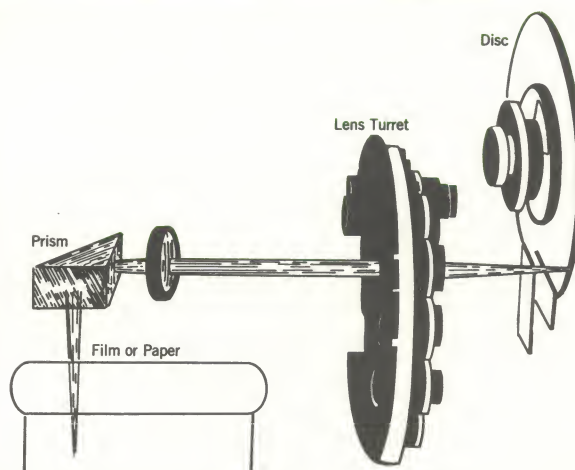
### Type Matrix

An eight-inch glass matrix disc is at the heart of Photon 200B phototypesetting. Fourteen hundred and forty characters, 90 of them for each of 16



separate type faces, are contained in photo-negative form in the disc. In use it undergoes no wear and lasts indefinitely.

The 16 type faces are each reproduced in 12 different type sizes by the 200B's optical system, so that the machine's total capacity is 192 type fonts, or 17,280 characters. The disc is also readily replaceable, so as to provide access to additional, completely different sets of 192 type fonts.



### Photographic Unit

The matrix disc, revolving constantly at 600 RPM, under precise electronic time calculation, places each character in position at the exact proper instant for exposure. A xenon flash tube is triggered for four microseconds (one quarter millionth of a second), to optically cast the character image. The light beam passes through the matrix disc to one of 12 sizing lenses, to a reflecting prism, to the photosensitive film or paper.

### Image Quality

Character density of optimum quality is obtained by high-speed, double-flashing of each character in type sizes above 42 points (single flashes for all smaller sizes).



## Product

The Photon 200B produces typesetting of the highest order of quality — clean, sharp — on film or paper. A choice of right-reading or wrong-reading composition is produced via a universal carriage which permits change from one mode to the other by a simple prism substitution. (A different film or paper magazine is recommended for each mode.)

## Type Face and Size Selection

A fingertip lever enables the operator to select from the 16 type faces, by name.

Another lever selects 12 chosen type sizes from 5 to 72 point. (Use of slip-in lenses allows the 200B alternately to produce 20 or more different sizes, including custom sizes for special purposes if desired.)

Size and style mixing are freely performed in the same line and from line to line. Justification and base alignment remain undisturbed. Full keyboard speed is maintained, and no operator calculations are required.

## Justifying

Inter-word justifying spaces are inserted automatically when the JUSTIFICATION key is touched at the end of each line. Simple inter-word spacing dial pre-selection meets normal copy-fitting situations. This dial can be easily readjusted to "stretch" or "squeeze" inter-word spaces to meet all unusual situations.

## Function Controls

**Letter spacing** is entirely automatic. Photon 200B automatically computes the correct set widths for all characters, without operator involvement. When kerning and special effects are desired the machine provides more than 80 different set widths.

**Multiple justification controls** simplify the setting of business forms, tabular matter, column headings and display ad matter.

**Automatic leader line and blank space** insertion speeds directory and catalog composition.

**The centering button** causes whatever has been keyboarded to be centered in the pre-set line length, irrespective of differences in type styles or sizes within the line or from one line to the other, or of changes in line lengths.

**The flush right and flush left** buttons automatically produce quadded lines in the selected line length, non-justified.

By use of the **line length set** button, 900 different line lengths (up to 54 picas) are selected. Run-arounds are also obtained via this control.

**Leading** is obtained in increments of 1/10 point, to 49.9 points, ultra-accurately and automatically.

**Extra lead** is added at any time without disturbing the basic setting.

**Reverse leading** — Reversing the feed of the photo film or paper allows setting of complicated blocks of copy of varying type sizes, and also allows in-line point size mixes, with minimum control changes.

## Corrections

When an error in typescript is caught before photography, the operator may kill the entire line. Or, unique to Photon, he touches the BACKSPACE key which removes previously coded information for each character in error within the line. The memory unit accepts and stores the new code information.

## Features

**Direct keyboard operation** for maximum composing versatility.

**Type font capacity:** Total 192: 16 faces in 12 sizes, 5 to 72 point.

**Matrix disc:** Interchangeable, made to buyer's specifications.

**Line length:** To 54 picas.

**Leading:** 1/10 pt. increments, 0 to 49.9 pts.

**Unlimited mixing** of styles and sizes in same line and line to line.

**Justification:** Automatic, mixed, multiple.

**Centering, quadding:** Automatic, accurate, unaffected by type styles or sizes.

**Memory-keyboard** permits correction within a line.

**Insertions** of leaders, dashes, blanks, special characters: Automatic.

**Add lead:** For addition to leading without changing basic setting.

**"One unit"** control for fast alignment of columnar work.

**Forward or reverse** movement of photo material. Photo paper (100-foot rolls) or film (50-foot rolls) accepted in various widths up to 8".

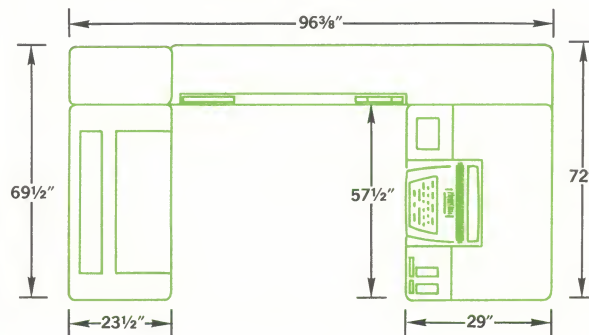
## Specifications

**Power requirements:** 110V AC

**Power consumption:** 15 AMP

**Weight:** Keyboard Unit 1,475 lb.; Relay Unit 675 lb.; Photographic Unit 1,400 lb. (Uncrated)

**Height:** Keyboard Unit 29½"; Relay Unit 30¼"; Photographic Unit 45".



**PHOTON, Inc.**  
WILMINGTON, MASSACHUSETTS



Photon's new Tapemasters bring to phototypesetting the revolutionary *Dual-Drive* concept — selective use of both tape-driven operation and direct-keyboard operation in one machine. The four Tapemaster configurations\* differ as to tape programs they accept and thereby as to degree of typographic versatility in tape operation.

Tapemasters represent the latest phototypesetting technology. They are carefully conceived systems for optimum handling of practical phototypesetting situations and needs, as seen by the most experienced manufacturer in the field.

## Need

As pioneers in phototypesetting and makers of both the greatest number of units and the broadest model line, Photon has obtained unmatched familiarity with both tape-driven and on-line machines and techniques. This experience has shown that in some phototypesetting, tape operation is highly advantageous, while at other times direct keyboarding is preferred. Recurring variations in both nature and size of the job make the difference.

Tapemaster 201, 202, 213 or 260 phototypesetters\* switch in seconds from tape-driven to direct keyboard operation, to handle any given assignment with optimum efficiency. Resulting economies exceed those from any other phototypesetting system.

## Concept

Two operating modes are used selectively. The first is a one-stop operation occurring directly at the machine's attached typewriter keyboard. Only one person is involved, no tape whatever is generated, and there is no other time delay factor. Keyboard and photographic units are cable-connected. Production is immediate.

In the second, Tapemasters are driven by paper tape generated by computers or by common perforator-keyboards. In this mode all types of work are handled, from ad-setting to straightmatter production at up to 14 lines per minute. Thus, maximum productivity is obtained in many applications using tape, yet immediate reversion to direct keyboard operation is possible, to make last-minute changes or handle small assignments efficiently.

Photon Tapemasters' *successful avoidance of tape for some operations* is a basic advance over earlier phototypesetters operating only in that mode. Tape is clearly advantageous in some usages — as when it can be produced by computers or by multiple, simple keyboards. But when keyboarding is from the typesetter's own specialized keyboard, then the interjection of tape between it and the photo unit can strongly hinder efficiency in many applications.

In non-computerized ad-setting, the ability to use the direct keyboard mode, bypassing tape, is vital. This flexibility often guarantees that the Photon machine will produce a definite, greater number of lines per shift, at lower cost, than the leading competitive tape-using devices being replaced.

## When a Computer is Coming

Tapemaster 201, 202, 213, and 260\* provide optimum typesetting capability both before and after a computer installation. Beforehand, the Tapemaster is used in experimentation



and training without disturbing regular keyboard production. When the computer goes in use, tape-driven phototypesetter operation predominates; but the *Tapemaster's direct keyboard mode will still be invaluable for last minute changes and small or specialized assignments.*

## Back-up Capability

In a newspaper or other operation involving a Tapemaster for ad composition and a separate tape-driven *straightmatter* machine such as the Photon 713 Textmaster for text production, *each machine provides back-up to the other.* The Tapemaster 201 will accept 713 tape and produce straightmatter at speeds up to 14 lines per minute in an emergency. (Photon 713 also has typographic flexibility to handle a range of ad-setting requirements.) In the same way, Tapemaster 213 provides a back-up to a Photon 513 Displaymaster in computer-driven ad-setting. Similarly, a 260 provides back-up to a Photon 560 Displaymaster computer-driven ad-setter.

## Combination Use

As a double-duty machine, the Tapemaster can *satisfy the total typesetting requirements* of a small publication with a limited-scale computer facility. Computer tape drives the Tapemaster in production of straightmatter at a net speed equal to the fastest tape-driven linecasting machines. And the Tapemaster will of course handle all ad-setting, either via tape drive or in the direct keyboard mode.

## Direct Operation

Photon Tapemasters produce complete copy-block typesetting directly from the typewriter keyboard, without tape interjection.

The operator fulfills detailed, complete typesetting assignments using automatic controls to produce typographic formats of any complexity.

The typewriter and the contiguous controls provide command over every job element. The operator selects and mixes 192 type fonts without delays or calculation and with complete freedom. Function and spacing controls are automatic, available at the touch of a button.

When a key is struck its code is stored in a memory unit. Not until the line is complete and acceptable to the operator will any of it be passed to the optical system and actually typeset.

\*The four Tapemaster models differ as to tape formats accepted by each machine. See Features.



## Type Matrix

An eight-inch glass matrix disc is the heart of Tapemaster phototypesetting. Fourteen hundred and forty characters, 90 for each of 16 separate type faces, are in photo-negative form in the disc.

The 16 faces are each reproduced in 12 different sizes by the Tapemaster optical system, so that the machine's total capacity is 192 type fonts, or 17,280 characters.

## Photographic Unit

The matrix disc, revolving constantly at 600 RPM, under precise electronic time calculation, places each character in position at the exact instant for exposure. A xenon flash tube is triggered for four microseconds (millionths) to optically cast the character image. The light beam passes through the matrix disc to one of 12 sizing lenses, to a reflecting prism, to the photosensitive film or paper.

## Image Quality

Character density of optimum quality is obtained by high-speed, double-flashing of each character in type sizes above 42 points (single flashes for all smaller sizes).

## Type Face and Size Selection

A fingertip lever enables the operator to select from 16 type faces, by name. Another lever selects 12 type sizes from 5 to 72 point.

Size and style are freely mixed in the same line and from line to line. Full keyboard speed is maintained. No operator calculations are required.

## Justifying

Inter-word justifying spaces are inserted automatically when JUSTIFICATION key is touched at end of each line. Simple inter-word spacing dial pre-selection meets normal copy-fitting situations. The dial is easily readjusted to stretch or squeeze inter-word spaces to meet all unusual needs.

## Function Controls

**Letter spacing** is entirely automatic.

**Multiple justification controls** simplify the setting of complex matter.

**Automatic leader line and blank space** insertion speeds directory and catalog composition.

**Centering button** causes whatever has been keyboarded to be centered in pre-set line length.

**The flush right and flush left** buttons automatically produce quadded lines in the selected line length.

By the use of **line length set** button, 900 different line lengths (up to 54 picas) are selected.

**Leading** is obtained in increments of 1/10 point, to 49.9 points, ultra-accurately and automatically.

**Extra lead** is added at any time without disturbing the basic setting.

**Reverse leading** — Reversing feed of the photo film or paper allows setting of complicated blocks of copy of varying type sizes.

## Corrections

When an error in typescript is caught (in direct keyboard operation) before photography, the operator may kill the entire line. Or, unique to Photon, he touches the BACKSPACE key which removes coded information for each character in error within the line.

## Features

**Direct keyboard operation** for the maximum composing versatility.

**Paper tape operation** for maximum productivity in large volume situations. Four Tapemaster configurations:

Model	Tape Source	Tape Format	Tape Program	Tape Content Characteristics	Typographic Functions Controlled By Tape
201	Computers, wire service, or any counting keyboard	6-channel, single frame	TTS®	Set widths not in tape but line must be justifiable (within justifying range and width end of line code inserted).	Up to 4 type fonts only
202	Computers, or any counting keyboard	6-channel, single frame	Expanded TTS®	Same as above	All functions except line length
213	Computers only	6-channel, single frame	Expanded TTS® (Photon 513 Program)	Line must be actually justified (word spacing and/or letter spacing computed), but without this data transmitted in tape.	All functions
260	Computers only	8-channel, 2 frame; or 6-channel 3 frame	Photon 560 Program	Same as above except the data is actually transmitted.	All functions

**Type font capacity:** Total 192: 16 faces in 12 sizes, 5 to 72 point.

**Matrix disc:** Interchangeable, made to buyer's specifications.

**Line length:** To 54 picas.

**Leading:** 1/10 pt. increments, 0 to 49.9 pts.

**Unlimited mixing** of styles and sizes in same line and line to line.

**Justification:** Automatic, mixed, multiple.

**Centering, quadding:** Automatic, accurate, unaffected by type styles or sizes.

**Memory-keyboard** permits correction within a line.

**Insertions** of leaders, dashes, blanks, special characters: Automatic.

**Add lead:** For addition to leading without changing basic setting.

**"One unit"** control for fast columnar alignment.

**Forward or reverse** movement of photo material. Photo paper (100' rolls) or film (50' rolls) accepted in various widths up to 8".

## Specifications

**Power requirements:** 110V AC

**Power consumption:** 15 AMP

**Weight:** Keyboard Unit 1,475 lb.; Relay Unit 675 lb.; Photographic Unit 1,400 lb. (Uncrated)

**Height:** Keyboard Unit 29½"; Relay Unit 30¼"; Photographic Unit 45". **Width:** 96⅜". **Depth:** 99½"

**PHOTON, Inc.**  
WILMINGTON, MASSACHUSETTS

The Photon 513 Displaymaster System is based on a high-production, computer-driven, photographic typesetting machine especially designed for publication display advertising and other typographically complex matter characterized by a constant, wide mix of type faces and sizes.

Driven by six-level, single-frame, TTS® format, perforated paper tape, the 513 machine produces finished typesetting accurately and automatically, on photo-sensitive film or paper. Page make-up time is greatly reduced since, to an extensive degree, the work is produced in copy-blocks, minimizing the number of pieces to be pasted or stripped.

513 System permits simplified computer programming that keeps both the needed keystrokes and the keyboard operator skill requirement to the minimum. The use of 6-channel tape (single level) requires the least possible computer punch time.

### Procedure

Unjustified paper tape is punched on conventional tape-perforating keyboards. Tape is then data-processed by a computer, which inserts codes to establish all typographic functions . . . type face and size, leading, measure, quadding, hyphenation and justification . . . for completely automatic operation of the 513.

### 513 Tape Control Unit

The computer-generated tape is processed through a mechanical tape reader which drives the photographic typesetter unit. The tape controls the selection of 192 different type fonts, consisting of 16 type faces, each present in 12 type sizes from 6 through 72 point.

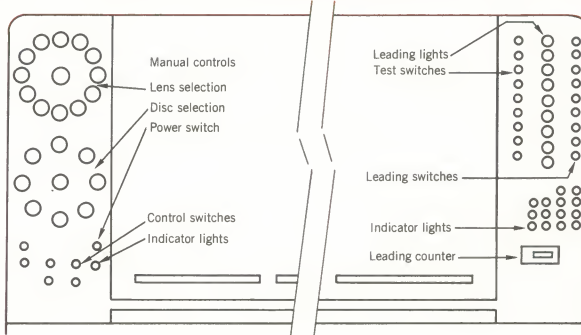
The 513 System provides for unlimited mixing of type styles or sizes within the line and from line to line, with precise base alignment. Line lengths up to 54 picas (9") are set.

Although the computer necessarily calculates the correct width values for every character, these values need not be passed on to the 513 since its control unit makes its own width calculations for all characters and spaces. Thus, the information needed to be passed from computer to phototypesetter is much less than would otherwise be possible, and much less tape is involved. A very significant amount of the computer's tape punching time is thus saved, and the use of simple 6-channel tape is made possible.



### Control Panel

The simplified controls are normally set at "automatic." Manual controls are provided to select type size, type face, and leading when desired to override a tape signal and alter one of these typographic factors.



### Type Matrix

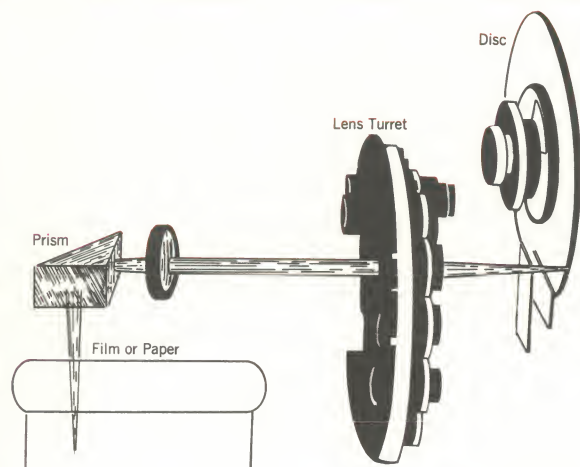
A glass matrix disc is at the heart of the Photon 513's imaging system. Sixteen different 90-character type faces are arranged in semicircles on the durable eight-inch disc. Each face can produce imaging in twelve different sizes (selected by the buyer) from 6 to 72 point, by the action of twelve lenses. Thus, 192 different type fonts are contained in the disc.

### Photographic Unit

The spinning master matrix is illuminated to cast each selected character. A xenon flash tube is triggered for four microseconds (1/250,000 of a



second). The light beam passes through the matrix to one of the 12 lenses, which projects the character in the specified point size. A prism reflects the beam onto the photo-sensitive film or paper.



## Product

Photon 513 produces type at a rate of 10 characters per second. The end product, on film or paper, is critically sharp typography.

A choice of right-reading or wrong-reading composition is produced via a universal carriage which permits change from one mode to the other by adding or removing a prism. (A different film or paper magazine is recommended for each mode.) The work leaves the 513 photo unit ready for photographic development followed by page make-up and reproduction by conventional methods.

## Features

**Computer input requirement:** Compatible with all paper tape-producing computers programmed for a given application.

**Type font capacity:** 16 type styles, 12 point sizes (6 to 72 point), for full 192 font mixing via one matrix. Matrices readily changeable.

**Leading:** From 0 to 63 points in one point increments, alterable automatically by tape codes, or manually.

**Line length:** To 54 picas.

**Mixing:** Any combination of type styles and sizes on the same line. Justification and quadding are accurate and automatic.

**Photo paper** (100-foot rolls) or film (50-foot rolls) accepted in various widths up to 10 inches.

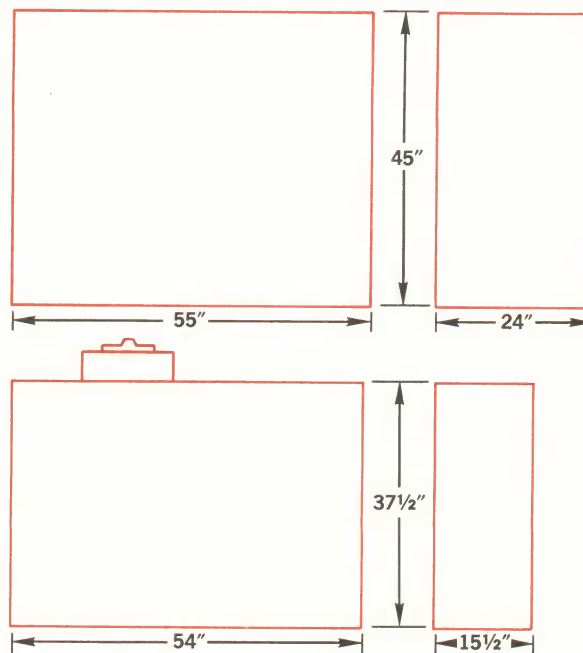
## Specifications

**Tape:** 6-level, single frame, TTS®, advance feed hole.

**Power requirements:** 110V AC, 60 cycle.

**Power consumption:** 10 amperes

**Weight:** control unit, 600 pounds  
photo unit, 1400 pounds



**Note:** Model 513 machines manufactured after March 1966 incorporate these differences from earlier versions:

**Photo unit is forward reading** rather than backward.

**Maximum line length is 9 inches** rather than 7.

**High-speed line leading mechanism** has been adopted.

**Improved flash circuitry** and lens filters reduce needed light flashes to **two** at 72 point size. Only one flash is used at 42 point and smaller sizes. Minor differences in computer programming are occasioned by these Model 513 improvements.

Means for achieving compatibility between these and earlier machines should be discussed with a Photon representative.

**PHOTON, Inc.**  
WILMINGTON, MASSACHUSETTS

# PHOTON

PHOTOTYPESETTING EQUIPMENT

# 560

## DISPLAYMASTER

The Photon 560 Displaymaster is a low-cost, computer-driven photographic typesetter designed for automatic production of text and complex matter of high typographic quality.

The 560 adapts well to newspaper display advertising setting, as well as to scientific, engineering, educational, industrial and other specialized typesetting. It is invaluable in printing-out the results of scientific computations, where speed as well as readability of print is important. The 560 is highly applicable to both mathematical and tabular matter. Character width values are established by the computer and can be altered to fit any purpose.

The Photon 560 owes unusual versatility to the combination of two factors: the completeness in range of functions that can be computer-programmed, and the extremely great mix of type styles and sizes available in the 560 photographic unit.

Driven by 8-level, 2-frame perforated paper tape, the 560 accurately and automatically produces finished type in complete copy blocks on photosensitive film or paper. Thus, page make-up time is considerably reduced.

Used in conjunction with any digital computer producing binary coded output, the Photon 560 is the most highly productive and the most economical machine of its kind on the market.

### Procedure

Unjustified paper tape is prepared on conventional tape-perforating keyboards, and is data-processed by a computer for the selection of all characters and width values, and to encode all typographic functions.

The computer calculates all justification by proper selection of spacing codes between words (normal justification) or between characters (letter spacing) or both, as programmed. Centering and quadding are provided in the same way.

The computer-generated tape directly actuates the Photon photographic system. The 560 automatically selects and responds to instructions as to type faces and sizes, and carries out all typographic functions — leading, quadding, centering, justification, hyphenation.

The tape necessarily contains character width instructions. (An essential difference between the Photon 513 and 560 models is the latter's dependence on the computer for this computation.)

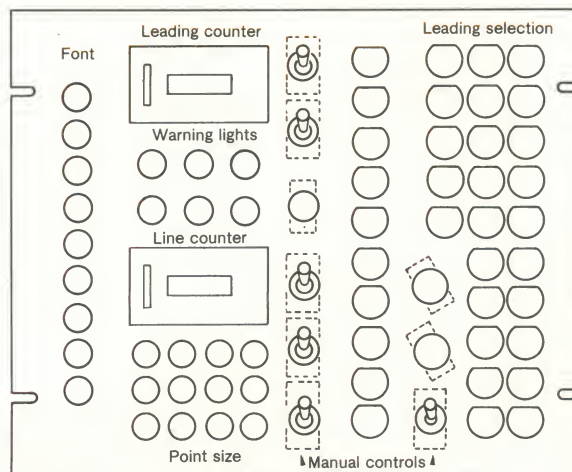
### Tape Control Unit

The computer-generated tape is processed through a mechanical tape reader which drives the photographic typesetter unit. The tape controls the selection of 192 different type fonts, consisting of 16 type faces, each present in 12 type sizes from 6 through 72 point.



The 560 system permits unlimited mixing of type faces and sizes within the line as well as from line to line, with precise base alignment. Maximum line length is 54 picas (9"). Leading from 0 to 49 points is obtained in increments as small as one point via codes in computer tapes (or 1/10th of a point via manual insertion at the control panel).

Because the computer-generated tape carries all information, the 560 control rack requires only simple transcription circuitry. Therefore, purchase price is lower than that of comparable phototypesetters. The buyer with a computer capable of producing 8-level tape thus finds the Photon 560 greatly to his advantage.



### Control Panel

A control panel on the transcription rack includes warning lights to indicate status or malfunction of tape or photo unit elements, and manual controls. The latter may be used to override tape signals for selection of leading, continuous leading, and forward-reverse leading. Controls also provide for on-off switching, a line counter, and a stop-at-end-of-line.

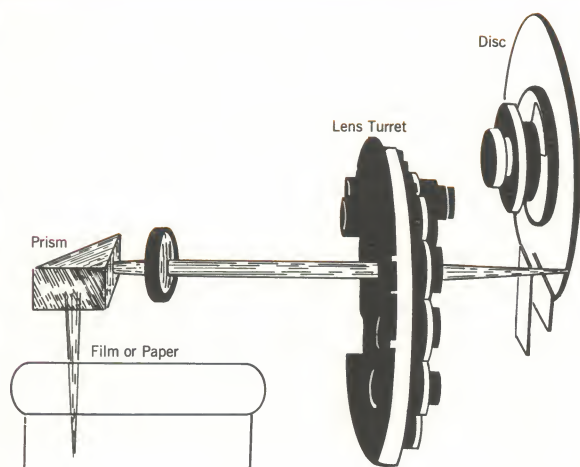


## Type Matrix

A glass matrix disc is the key part of the Photon 560's imaging system. Sixteen different 90-character type faces are arranged in semi-circles on the durable eight-inch disc. Each type face can produce imaging in 12 different sizes (selected by the buyer) from 6 to 72 point, by the function of lenses. Thus, 192 different fonts are contained in each disc. The buyer specifies lens sizes and type faces in the disc. He may also obtain additional, interchangeable, discs providing different faces and special symbols.

## Photographic Unit

A rotating master matrix is illuminated by an electronically-triggered xenon tube with a flash duration of four microseconds, or 1/250,000 of a second. The light beam passes through the matrix character to one of the 12 lenses, which projects the character in the specified point size. A prism reflects the beam onto photosensitive film or paper. (Supplemental lenses may be placed in the lens turret to provide additional point sizes.)



## Product

Photon 560 produces type at a rate of 10 characters per second. The end product, on film or paper, is critically sharp typography.

A choice of right-reading or wrong-reading composition is produced via a universal carriage which permits change from one mode to the other by adding or removing a prism. A different film or paper magazine is recommended for each mode.

The film or paper is taken from the photo unit ready for photographic development, followed by page make-up and reproduction by conventional methods.

## Features

**Computer input requirement:** Compatible with 8-level, 2-frame computer-generated paper tape programmed for a given application. (A 6-level, 3-frame tape format also may be employed.)

**Type font capacity:** 16 type faces, 12 point sizes (6 to 72 point), for full 192 font mixing via one matrix. Matrices readily changeable.

**Leading:** From 0 to 49 points, in one-point increments, when altered automatically by tape codes, or 1/10th point when altered manually.

**Line length:** To 54 picas (wrong-reading) or 42 picas (right-reading).

**Mixing:** Any combination of type styles and sizes on the same line. Justification and quadding are accurate and automatic.

**Photo paper (100-foot rolls) or film (50-foot rolls)** accepted in various widths up to 10 inches.

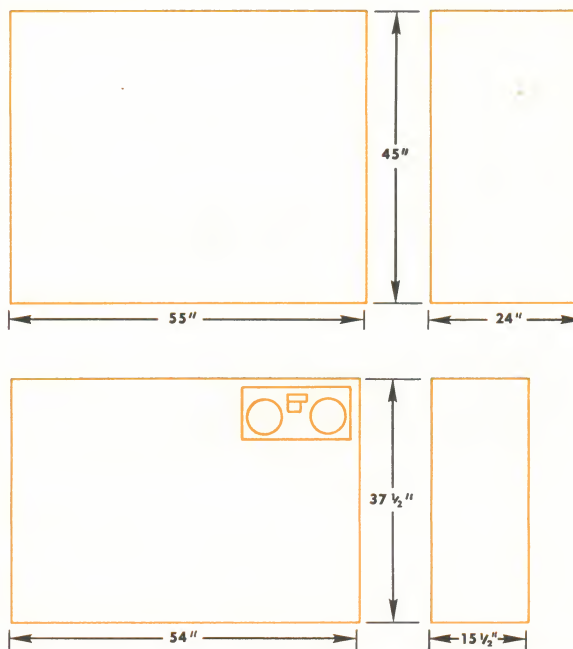
## Specifications

**Tape:** 8-level, 2-frame

**Power Requirements:** 110 V AC, 60 cycle

**Power consumption:** 10 amperes

**Weight:** Control Unit, 350 pounds  
Photo Unit, 1400 pounds



**PHOTON, Inc.**  
WILMINGTON, MASSACHUSETTS

Photon 713 Textmaster is a general-purpose photo-typesetter for the high-speed production of both straight matter and complex composition in newspaper, magazine, book and directory publishing, and in typography and printing plants. Whether driven directly by keyboard tape, by computer-generated tape or by wire service tape, the 713 sets columns of type automatically on photosensitive film or paper.

### Capability

Photon 713 can produce complete typographic formats directly from paper tape perforating keyboards. The typist carries out the entire composing job.

The keyboard encodes instructions on either six- or eight-level tape for complete, automatic operation of the 713. The tape controls type face and size, line leading, line length, and quadding.

Keyboards may be operated remote from the 713 machine. Five or more keyboards may be required to fully occupy one 713, depending on the type of composition and its variable effect on keyboard productivity.

### Keyboard input

Photon 713 Textmaster is compatible with all tape-perforating keyboards and tape-generating computers. Common TTS® and other code bases are employed.

Unjustified tape produced on conventional keyboards can be justified by a computer. Computer-generated tape drives the 713 to produce justified copy.

Justifying keyboards such as Friden, Fairchild and others produce paper tape that drives the 713 directly.

Note: The 713 may be driven directly by computer magnetic tapes when the optional Photon Magnetic Tape Reader Control Unit is employed.

The 713 also operates directly from wire service tape, without necessity for conversion.

Some keyboards producing six-level TTS® codes are specially designed for and excel in production of straight matter (text) composition, of minimum complexity. In more complex varieties of composition a special Photon 713 keyboard may be employed for maximum productivity and ease of operation.

### Product

Photon 713 produces type at 20 characters or more per second, and 35 or more newspaper lines per minute.

The end product is excellent typography, composed as specified, ready for photographic developing and make-up for reproduction by offset, letterpress, gravure or other methods.

The 713 is not confined to text matter; it adapts well to a variety of tabular and other complex forms of composition.

### Tape control unit

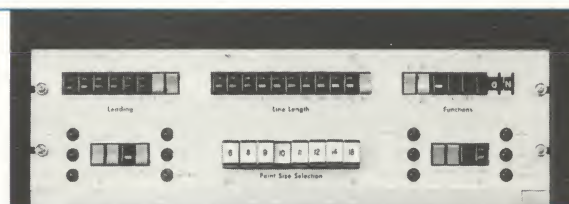
The tape is processed through a photoelectric tape reader which drives the photographic typesetter. The tape controls the selection of eight different type faces, each of which produces copy in eight type sizes from 5 through 18 point. Type faces may be mixed from line to line or on the same line. Line lengths up to 45 picas (7½") may be set with any style or size.

Tapes are read at a speed of 500 characters per second. Each complete line is read and put into magnetic core memory, this process occurring during return of the optical carriage from the preceding line.



### Control panel

The simplified controls are normally set at "Automatic." Manual controls are however provided to allow over-ride of a tape signal so as to alter a typographic factor.

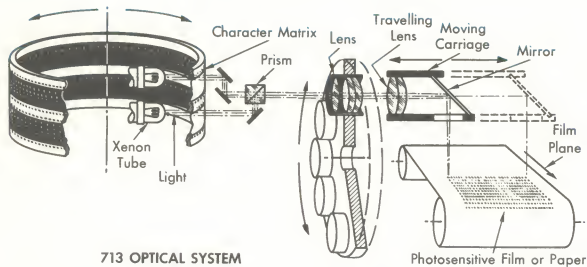


Solid state circuitry, with modular construction, assures reliable operation, dependable performance, simple maintenance.



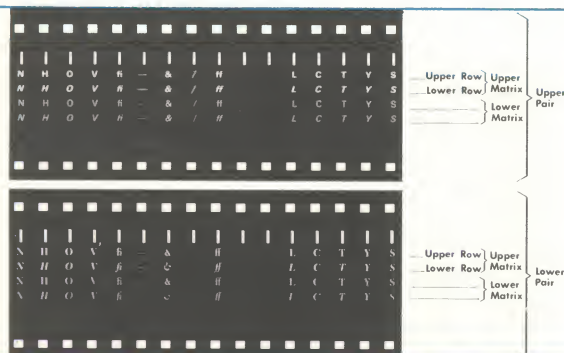
## Photographic unit

Two matrix strips (film negative) containing eight different type faces are carried on a rotating matrix drum. Xenon tube light flashes of 1.5 microseconds (millionths) duration cast the image of each selected character. The light beam passes through the matrix strip to one of eight lenses, which projects the character in the specified point size. A prism reflects the beam onto photo-sensitive film or paper. A choice of right-reading or wrong-reading composition is produced through an appropriate type matrix arrangement.



## Type matrices

Photon 713 can mix eight styles of type in one line. Mixing is accomplished by the font arrangement on the matrix strip and placement of the strip on a matrix drum.



When strips are actually mounted on the drum, they are seen as inverted mirror-images.

The 713's two matrix strips each contain four complete type faces. The strips are held on a drum rotating on a vertical axis at 30 revolutions per second. Full selectivity of the eight levels on the drum permits mixing of all eight type faces in one line.

## Photon 713 in a computerized photo-typesetting system

Photon developed the 713 to take advantage of high speeds attained by use of input from computers (as well as from keyboards and wire service) in producing type composition.

Unjustified tape produced at a keyboard can be made justified by computer. Other typographic functions may similarly be automated.

Correction tape merges with the original tape in a computer, and emerges as corrected, re-justified, re-perforated tape that drives the 713.

As instructed by the coded paper tape Text-

master selects the proper type face and point size, adjusts to proper measure, provides leading, quadding . . . all automatically.

In minutes a complete page is exposed on film or paper. The film magazine is removed from the photographic unit for developing, fixing, drying and delivery for paste-up.

## Features

**Tape operated:** 6- or 8-level, standard TTS or other codes. Any color, or center or advanced feed hole tape accepted.

**Keyboard input:** Photon keyboard for maximum composing versatility; many other tape-perforating keyboards adaptable.

**Wire service input:** Usable without conversion.

**Computer input:** Compatible with all paper tape-producing computers.

**Type font capacity:** 8 type styles, 8 point sizes (5 to 18 pt) or two matrix strips, for full 64-font mixing, matrix strips changeable.

**Leading:** Half-point increments, 0 to 31½ points.

**Line length:** To 45 picas.

**Mixing:** Any combination of type styles on same line.

**Matrices:** Interchangeable, inexpensive.

**Justification, quadding and centering:** Accurate, automatic.

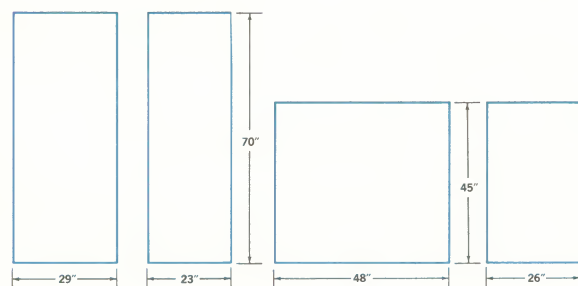
**Photo paper** (100 ft. rolls) or film (50 ft. rolls) accepted in various widths up to 8".

## Specifications

**Power requirements:** 115V, 60C, single phase.

**Power consumption:** One KVA.

**Weight:** Control unit 450 lb.: Photo unit 800 lb.



**PHOTON, Inc.**  
WILMINGTON, MASSACHUSETTS

Optional

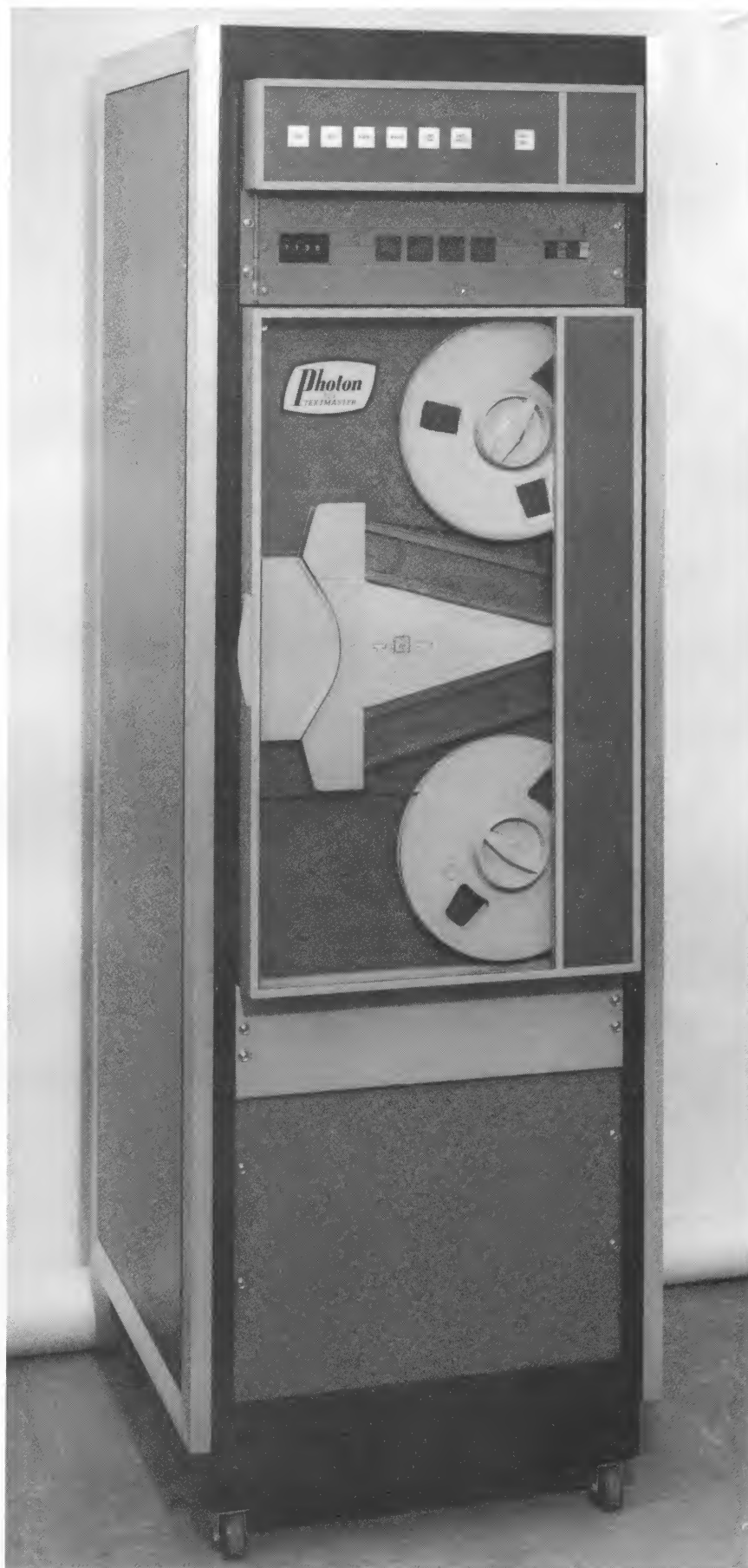
MAGNETIC TAPE

READER-DRIVE UNIT

for the PHOTON 713

TEXTMASTER

PHOTOTYPESETTER





OPTIONAL MAGNETIC TAPE  
READER-DRIVE UNIT FOR  
THE PHOTON 713 PHOTOTYPESETTER

The MTRD Unit enables operation of the Photon PHOTON MODEL 713 TEXTMASTER MACHINE directly from computer-generated magnetic tape. Adoption of magnetic tape in preference to perforated paper tape in a given computerized typesetting operation might be based on one or more of these objectives:

Save computer time. Common computer-driven paper tape punch speeds of 110 characters a second contrast with the 25,000 characters per second (and higher) rates at which computers can generate magnetic tape. However, the practical difference between the two tape processes in actual elapsed production time may be regarded as 10 to 1. Therefore, as an example, paper tape for a 20,000 word, 24-page printed booklet might be computer-perforated in 18 hours, while the equivalent in magnetic tape might occupy the computer for less than 2 hours.

Save equipment cost. Eliminating paper tape eliminates computer peripheral (tape punch) equipment.

Save tape storage space. A solid page of text containing 5,000 characters could require only about eight feet of magnetic tape vs. 48 feet of paper tape.

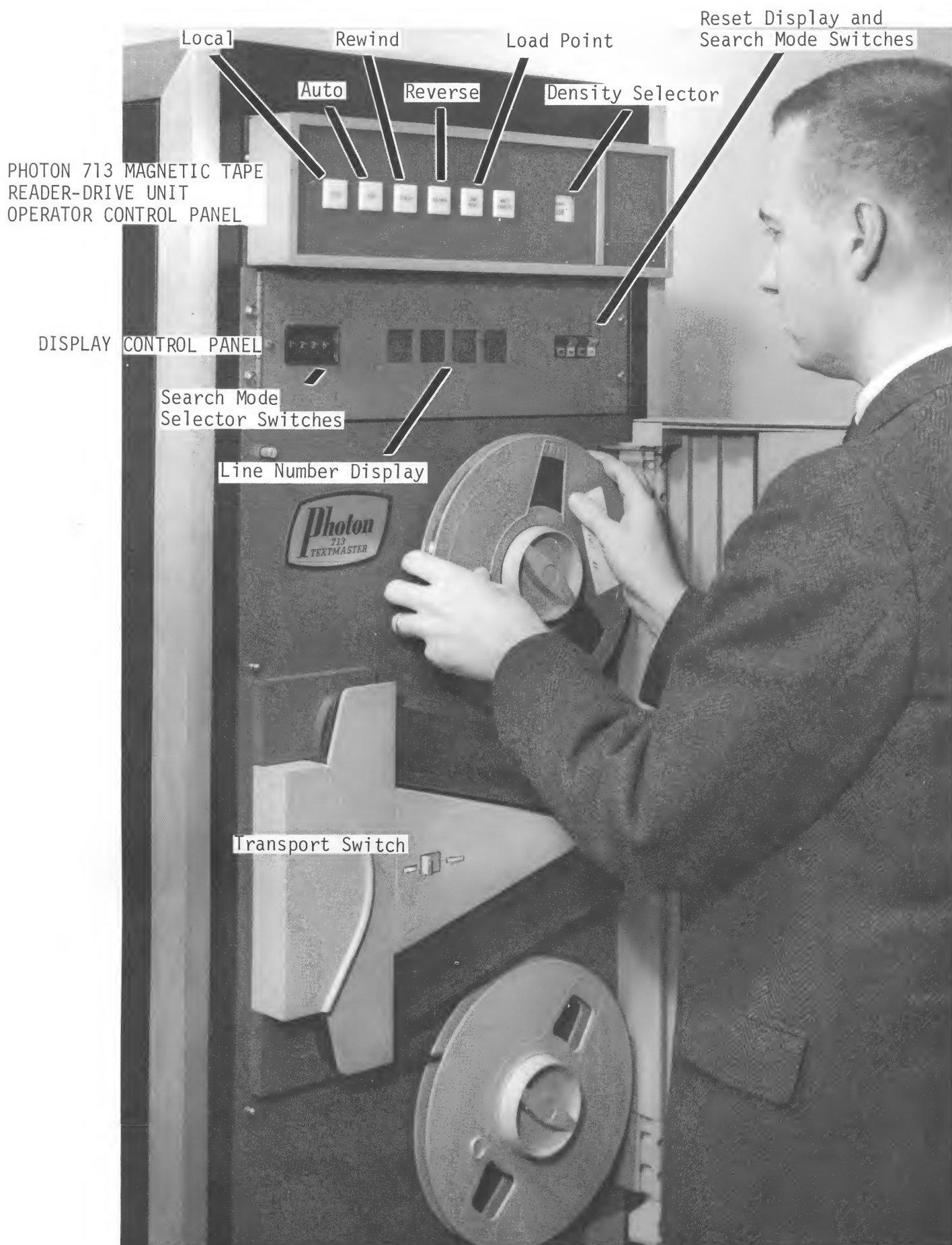
Save phototypesetter make-ready time. One loading of magnetic tape can drive the phototypesetter six times as long.

Optional MTRD features provide special capabilities. PARITY CHECK: A character-reading validity check stops the 713 whenever an even number of bits which form a character or function are read from tape. This feature prevents setting great amounts of type if a poorly recorded magnetic tape is read. SEARCH MODE: This feature, useful in corrections, permits rapid, automatic bypassing of many lines of type without setting them. When the pre-set search point is reached a control panel setting is made to instruct the setting of a desired number of lines, after which the machine will again stop automatically.

Paper tape capability is still retained. The Photon 713 Control Unit containing the photoelectric paper tape reader is not displaced by the MTRD Unit. The latter is cable-connected to the input side of the 713 Control Unit and is simply bypassed, via an On-Off switch, when reversion to paper tape input is desired. Among the operating flexibilities this offers is the use of non-computer generated paper tape for corrections following a primary 713 run via magnetic tape. In the ensuing final run (whether an entire or partial run) the ability to find exact positions in the magnetic tape (via MTRD's Search feature) enables selective inputting from both tapes, in desired sequencing.

All Photon 713 versatilities are retained. All typographic functions of the 713 can be reached from MTRD Unit input.

Magnetic tape is re-useable. Erasure makes possible re-recording of tapes.





SPECIFICATIONS —  
OPTIONAL MAGNETIC TAPE READER DRIVE UNIT  
FOR PHOTON 713

A. TAPE TRANSPORT

1. Magnetic Tape: 1/2 inch wide magnetic tape on standard 10 1/2 inch diameter reels, 6 level plus one level for parity.
2. Triple Density Read capability: 200, 556, 800 bits per inch.
3. Record gap: 0.75 inch per record.
4. Transport is equipped with a read-only capability. Speed: 5 inches per second.
5. Power Requirements:
  - Voltage regulation — 105 to 126 volts A.C.
  - Line Frequency Regulation — 58 to 62 cycles per second
  - Power Consumption-Standby — 4 1/2 amperes
  - Run — 6 3/4 amperes (average)
  - 8 amperes (peak)
6. Temperature: 0°F to 110°F
7. Humidity: 20% to 95% relative humidity
8. Load Point — A photosensing circuit is provided to search the beginning of the recorded portion on the tape. A similar sensing circuit is provided to stop the tape before the end of the reel.
9. Weight: 500 pounds
10. Dimensions: 23 1/2" W x 72" H x 28" D

B. SYSTEM

1. Tape Format:
  - Record — one justified or justifiable line of type.
  - Record gap — 0.75 inch record gap must immediately follow the end of line code of a record.
2. Character capacity per line: up to 255 character and function codes.

3. Tape coding:  
Standard TTS coding. Automatic operation of all machine functions from a 6 level tape is enabled by coding as follows:

<u>Function</u>	<u>Tape Coding</u>
Stop Code	Bell + Tape Feed
Upper Pair	Bell + Thin Space
Lower Pair	Bell + e
Kill Line	Bell + 3
1-unit space	Bell + elevate
Flush Right	Bell + Lower Matrix
Leading*	Bell + a
Add Lead*	Bell + \$
Lens 1	Bell + return
Lens 2	Bell +
Lens 3	Bell + d
Lens 4	Bell + -
Lens 5	Bell + r
Lens 6	Bell + 4
Lens 7	Bell + j
Lens 8	Bell + Bell
Line Length**	Bell + n

\* Immediately following the tape coding for these functions the value coding must follow.

Level 6 5 4 3 2 1

Value Coding 16 8 4 2 1 1/2 point

\*\* Immediately following the tape coding for line length the two value codes must follow.

Level 6 5 4 3 2 1

Value Coding 1st 16 8 4 2 1 1/2 relative units

2nd 1024 512256 128 64 32

4. Reading Speed — 5 inches per second data transfer speed during the read cycle of the 713 Textmaster.
5. System Compatibility — addition of a magnetic tape-driven 713 does not alter the paper tape reading capability.
6. Search Mode — a 5 inch per second, record searching capability of 0-9999 records enables scanning the tape for a particular line, then exposing after this point.
7. Automatic Stop Feature — the stop feature permits selection of the number of lines to be exposed, with stopping of the tape drive at this predetermined number. The capacity of lines is 9999. More lines can be exposed by resetting the counter and restarting the Photon 713.

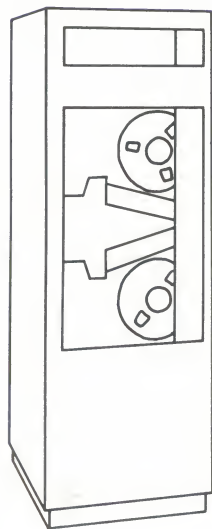


# PHOTON

PHOTOTYPESETTING EQUIPMENT

# ZIP 901

WORLD'S FASTEST  
GRAPHIC ARTS QUALITY  
COMPUTER PRINTOUT



## High-speed, magnetic tape-driven computer printer-phototypesetter

ZIP 901 is the world's fastest composer of high-quality type. It produces proportionally-spaced, alphanumeric, capital and lower case letter, multi-font imaging of *graphic arts quality*.

Net productivity generally equals that of 100 to 200 hot-metal typesetting machines, or of a 300 to 400 line-per-minute computer line printer. ZIP's typographic quality equals metallic typesetting.

Imaging at 500 to 800 characters per second depending upon line length and type font used, ZIP 901 produces a complete newspaper page with 50% text content in one minute, or a complete metropolitan telephone directory page in 45 seconds.

## Output: complete page makeup

ZIP 901's output medium is standard phototypesetting film or paper on which completely made-up pages including headlines are produced. Manual page assembly is eliminated because ZIP continuously images across all columns on the page. Line drawings and halftone photos are also precisely imaged and positioned exactly where desired by ZIP's optional Graphics Insertion capability.

\* Standard magnetic tape station is not supplied by Photon, Inc.

## Who uses ZIP 901 ? (As of early 1967)

**An auto manufacturer** is converting from computer line printers and conventional typesetting to ZIP 901 to produce parts catalogs and manuals.

**A telephone company** has replaced conventional typesetting with ZIP 901 to produce daily, monthly, and yearly telephone directories, has a second ZIP on order.

**A government agency** changed from line printers to ZIP to compose publications in which frequent photos and drawings are automatically intermixed with word matter.

**Another government agency** converted from line printers to ZIP to produce a mammoth monthly load of medical research abstracts. Their motive: to greatly improve readability while nearly doubling word content per page, with equivalent savings in printing costs.

**A commercial ZIP service bureau** sets quality type for price lists, directories, and technical publications. Another such bureau is preparing for use of customers' own tapes as input.

**Two large printing firms** are preparing for early ZIP 901 installations, and several other ZIP's are on order.

## How ZIP 901 operates:

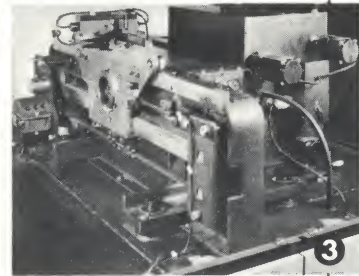
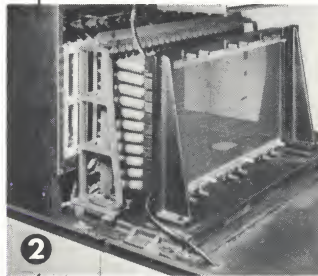
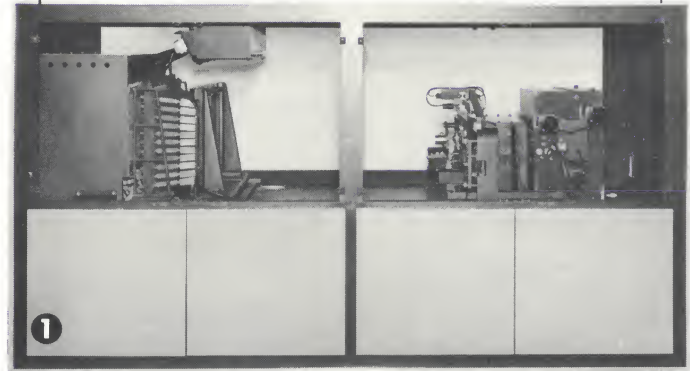
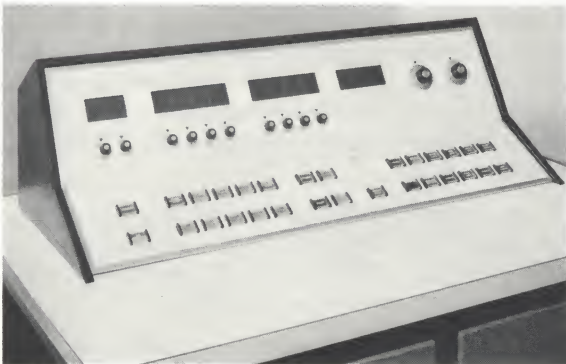
264 alphanumeric character images are stored as negative (transparent) images in a stationary glass grid, seen in Fig. 2 at right. Each character has its own xenon flash (Fig. 1 and 2) which emits light bursts of 2-microseconds duration through the grid to a laterally moving lens (Fig. 3). It delivers the character image to photo film or paper which is moved only for line spacing. The moving lens images a new line in each forward and backward traverse.

**Speed:** is a function of line length, not the number of characters in the line. Lines of 11 inches, for example, are imaged at 2.15 lines per second, regardless of content. The speed at which characters are flashed is enhanced by the fact that at any given position of the moving lens any character can be flashed. At any given instant images can be created at many different points along the line. The order of flashing need not and does not occur in the same order in which the words are read. Electronic computation determines the optimum flashing order.

## Comparison with other electronic phototypesetters

Controlled entirely by solid state electronics, ZIP employs a unique optical-photo basis of image generation that successfully avoids the necessity in other machines to display the character on the face of a cathode ray tube before transferring it by photography to the film or paper. ZIP's advantage thus is that *at equal or higher speeds* it produces a stable, clearly defined, distortion-free image. It is a solid, single entity image rather than one formed of dots.

Practical operating comparisons between ZIP 901 and other machines are shown in the table at right.



Factor	Photon ZIP 901	Most Publicized Cathode Ray Tube Typesetter
Max. speed claimed (in characters/sec.)	800*	600
Maximum image line length	11 inches. (Enables setting across all columns on page, to eliminate make-up.)	5.3 inches
Compose photos and drawings?	Yes	No
Tape Used	Magnetic Tape. (Produced much faster, more economically by computer.)	Paper tape only
Compatibility with computers	Extremely great	Limited
Degree of success	7 delivered, all in routine successful use as of 1/1/67; still greater number on order.	None reported in use as of 1/1/67

\*ZIP's speed varies according to length of line, type face and size. A bulletin detailing speeds under different conditions is available on request.

**PHOTON, Inc.**  
WILMINGTON, MASSACHUSETTS



# PHOTON

World Leaders in Phototypesetting

We appreciated your request for literature. May we send you something more? Photon makes so many different phototypesetter models – our line is by far the most complete – that it's probable we can provide you additional information you'd welcome. Check the attached card . . . and don't hesitate to jot down any special request.

PHOTON, INC.

## Please send me the literature marked:

- ☐ **Photon 713 Textmaster** - Unprecedented 35 line a minute speed, combined with 64 type font instant mixing power plus compatibility with 6, 7, or 8-channel paper tape from all keyboards, computers and wire service (also magnetic tape) make 713 the first photographic typesetter suited for broad purpose use by printers and typesetters, publishers and book manufacturers.
  - ☐ **201, 202, 213, 260 Tapemaster Models** - Dual-Drive design enables selective operation either by direct keyboarding or by tape from computers, TTS® or other keyboards, or wire service. Same machine can handle both display ad-setting and text, be equally efficient before or after a computer installation, and be tape-compatible with other typesetters.
  - ☐ **Photon 200B Admaster** - World's most-used phototypesetter in newspaper ad-making can handle every basic form of typesetting, mixes 192 fonts, 5 to 72 pt.. Direct keyboarding without tape.
  - ☐ **513 Displaymaster** - For automated, high-production newspaper ad-setting via 6-level, single frame paper tape, mixes 12 type sizes (5 to 72 pt.) of each of 16 faces with full typesetting versatility, entirely by tape command. Far less computer time and faster system throughput than with competitive phototypesetters.
  - ☐ **560 Displaymaster** - Lowest cost computer tape (8-level, 2-frame) model handles the most typographically-demanding applications.
  - ☐ **110 Editmaster** - Tape Merger machine automatically creates perfect tape, after proofreading, by merging original tape with a short correction tape using terse copy-block coding to identify line locations in tape.
  - ☐ **Photon 901 "ZIP"** - Driven by computer magnetic tape and operating in the speed range of computer impact printers (600 characters a second) ZIP produces completely made-up pages at 10 to 50 seconds each, yet retains high quality, true photographic imaging and variable type fonts.
  - ☐ Special request . . . . .
  - ☐ Have a local Photon representative telephone me at . . . . .
- Name & title . . . . .
- Organization . . . . .
- Address. . . . .

FIRST CLASS  
Permit No. 20  
Wilmington, Mass.

**BUSINESS REPLY MAIL**

No Postage Stamp Necessary if Mailed in U. S.

Postage Will Be Paid By

**PHOTON, INC.**

355 Middlesex Ave.

Wilmington, Mass. 01887

Marketing Dept.





# Description and Specifications – PHOTON ZIP 901 High Speed Computer – Phototypesetter Machine

The ZIP 901 is comprised of three elements: Basically, the **Electronic Control Console** processes information received from the **Magnetic Tape Handler** (not a Photon-furnished component) then presents the data directly to the **Photographic Output Unit**.

The Control Console provides all necessary manual and automatic control functions and indicating devices to achieve the desired operation.

The information input to the Console contains a sequence of characters, presented in the order in which they appear in the printed line, along with control information which gives the location of the line with respect to the text to be printed. Since only one line of print will be able to be recorded by the Photographic Unit during any one cycle, the Control Console processes only a single line at a time.

The Control Console is comprised of four major sub-areas:

1. **Control Panel** – containing a set of controls the operator will require for system operation. (See Fig. 1.)
2. **Maintenance Panel** – containing a set of controls and indicators enabling the technician to examine the functioning of the Control and to simulate various conditions for test.
3. **Memory Unit**
4. **Solid State Logic**

The ZIP Photographic Output Unit contains the mechanisms and solid state circuitry necessary for acceptance of signals from the Control Console. The Photographic Unit converts the incoming signals into a visual display and reproduces the characters on film (or paper) according to their real time sequence.



FIGURE 1. ZIP CONTROL CONSOLE

The images of all the characters are contained in a stationary matrix, a glass negative. (See Figure 5.) Each of the characters of the stationary matrix is provided with individual means of flash illumination. Character images are reproduced on film by a lens scanning alternately between two predetermined positions in such a manner that the entire film width is swept. A memory storage system and controlling circuits produce timing for the illumination of individual characters. The position of the character in the glass matrix and its relative position in the line being composed are taken into account by calculation.

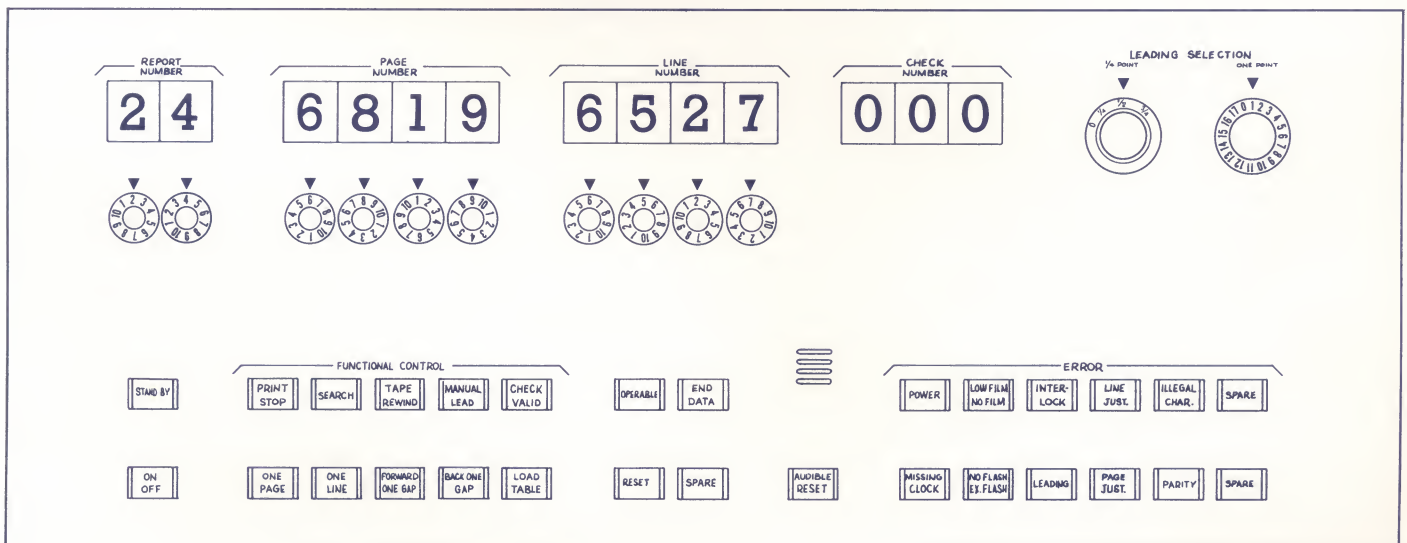


FIGURE 2. ZIP CONTROL PANEL



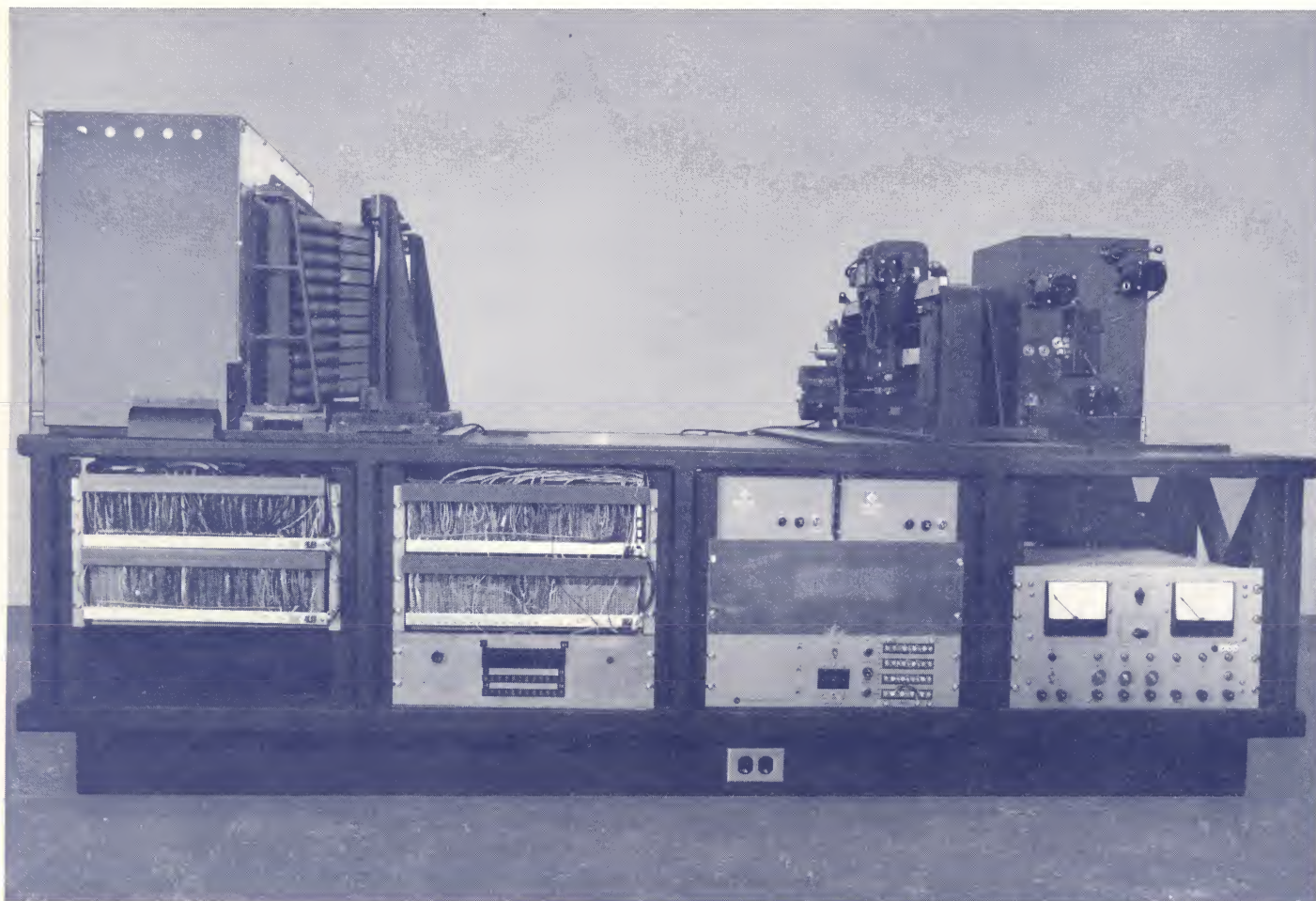


FIGURE 3. SIDE VIEW OF PHOTO UNIT-COVER REMOVED

To the observer, characters appear to be photographed at random as the lens moves. After each line has been composed, the photosensitive material is indexed to a new position so that the next line may be similarly composed.

A ZIP Matrix Assembly consists of three glass negatives, containing images of type in predetermined positions and precision mounted.

## PHOTON ZIP 901 Operating Specifications

### LENGTH OF LINE

Selective four (4") to eleven inches (11") in one inch increments.

### AVAILABLE POINT SIZES

Six (6) through fourteen (14) point.

### MATRIX

Total of two hundred sixty-four (264) characters comprising various type faces and sizes. The master characters are arranged on three (3) easily interchangeable matrix plates as shown in figure 5.

### SPEED

11" line - 2.15 lines per sec.  
10" line - 2.25  
9" line - 2.37  
8" line - 2.49

7" line - 2.64 lines per sec.  
6" line - 2.80  
5" line - 2.98  
4" line - 3.19

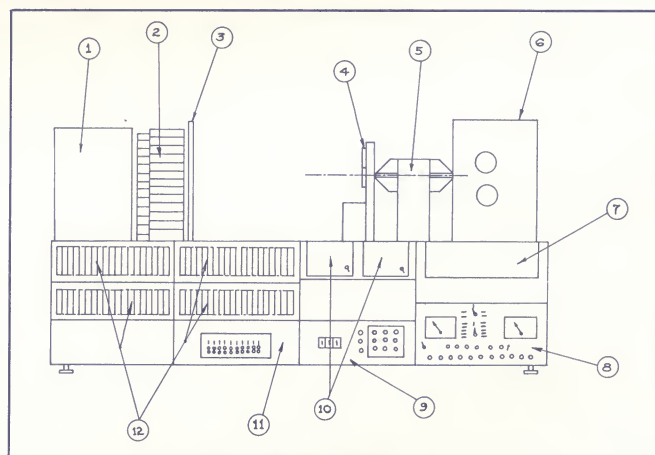


FIGURE 4.

1. Flash Tube Module Card Assembly
2. Flash Tube Modules
3. Matrix Assembly - (3 Glass Plates)
4. Reciprocating Lens Assembly
5. Character Alignment Mirrors
6. Film Magazine and Transport
7. Line Regulator
8. High Voltage Power Supply
9. Low Voltage Power Supply
10. Translators for Film Transport Control
11. Fuse Panel
12. Solid State Control Area



ROUTINE TELEPHONE DIRECTORY PRODUCTION BY  
PHOTON ZIP 901 AT NEW YORK TELEPHONE COMPANY

THE NEW YORK TIMES, THURSDAY, DECEMBER 1, 1966.

## NEW PHONE BOOK GOES ELECTRONIC

### Camera and Computer Print Staten Island Directory

By GENE SMITH

The New York Telephone Company will invade Staten Island today with 91,000 new telephone directories.

Ordinarily, this is just a regular annual event but the 1967 Staten Island telephone directory is the first ever set by a computerized photo-typesetting process. It marks the Bell System's entry into electronic directories.

This is the first step in a five-year program for conversion of all downstate white pages to this ultra-high speed printing method. The Rockland County directory, to be delivered next June, will be the second in line and will be followed in order by directories for the Bronx (1968 delivery), Brooklyn, Queens, Nassau, Westchester and Suffolk Counties.

#### Manhattan Book in '69

"By 1972 all downstate directories will be done this way," Morrill A. Mace, assistant vice president in charge of the directory department, said in an interview at his 100 Church Street headquarters yesterday. "The Manhattan directory will come in late 1969 or 1970 and eventually the Yellow Pages will be done in the same manner."

The Staten Island and Rockland County directories include both white and yellow pages and are printed by the Jersey City Printing Company.

The heart of the new system is a leased RCA 501-301 computer, which records on tape all telephone listings, and a Photon 901 machine made by Photon, Inc., of Wilmington, Mass. The latter machine, called a Photac (short for photo-typesetting and composing), reads the instructions from the computer tape, computes the order in which the characters will be lined up on the plate, composes the material and turns out the completed pages.

A directory printer at Jersey City Printing prepares metal plates from the Photon copy and prints and binds the directories. The type metal is then scrapped and the entire directory remains stored on tape. A single reel is all that is required for the 80,000 listings in the Staten Island directory.

New numbers, number changes, new listings and other data are fed each day into the computer so that when the next directory is ready for printing the process will be completely automatic. Photac alphabetizes, positions, indents and sets up listings in columns and pages.

#### 500 Listings a Minute

The system has been under development for over four years, according to Bernard R. Jansson, of New York Telephone's general projects staff, who is in charge of the program. He explained that each page is produced fully composed and justified in less than one minute. The Photon 901

actually "prints" 500 listings a minute, which is more than appear on the average directory page.

By contrast, the Photac system produces 30,000 listings an hour against about 100 an hour by a linotype operator whose work must then be proof-read and composed in page forms. Jersey City Printing keeps all directory pages in metal and corrections in the past have been made line by line. The new system does away with all of these processes.

Mr. Jansson said New York Telephone's use of the Photac is only the second time the equipment has been put into regular usage. The Department of Health, Education and Welfare has used similar equipment for its Index Medicus. It had to be enlarged to accept directory-size pages.

#### How the System Works

In operation the system is really a marriage of computers and camera systems.

As each character is read into the Photon machine, a light flashes behind one of 264 characters that are stored in a glass matrix.

This light is focused on a sheet of photo-sensitive material mounted on a take-up spool. Each light flash takes only 3 millionths of a second. A page has 3,651 spaces across and the light "reads" from left to right and then back from right to left on the next line.

Customers will benefit from the more updated listings since the printing process will be greatly shortened. The time lag from deadline to delivery will be cut from more than two months to several days.

# PHOTON ZIP 901

## High Speed Computer – Phototypesetter



The Photon ZIP is a proven phototypesetting system driven by the output magnetic tape of digital computers.

Producing 125 eleven-inch lines per minute, regardless of type size or number of characters in the line, ZIP is faster than any typesetting device in history. Actually, it reaches into the speed range of computer line printer machines. Since ZIP may, depending on the type style and size used, place three times as many characters and words in each line as does a computer printer, ZIP productivity often equals that of a 375 line per minute printer.

ZIP's product is true typesetting – it uses both capital and lower case letters, proportionally spaced, and in three different type faces or sizes, all of which are mixed as desired in any given line. Since ZIP output (on photo film or paper) is true Photon optical-photographic imaging (not cathode ray tube character image generation), it is of sharp typesetting quality.

ZIP employs the latest state-of-the-art developments in optics and electronics to effectively link electronic computer systems with typesetting to secure these practical advantages:



## Reduce typesetting machine investment cost in relation to units of productivity

ZIP's dramatic economic efficiency, as compared with the latest tape-driven metallic typesetting machines, is clearly seen in this simple table:

	Investment Cost	Production In 8 Point Words Per Hour	Cost Per 1,000 Words Per Hour
Fastest Linecaster	\$ 30,000	3,200	\$9.37
Photon ZIP	\$250,000	215,000	\$1.16

## Reduce operating costs by increasing productivity per hour of operator labor:

The two hourly output figures above clearly illustrate the great increase in human production effectiveness ZIP makes possible.

## Reduce operating costs by improving keyboarding productivity:

Computer involvement makes possible simpler keyboards and procedures and shorter training periods. Above all, due to reduced keystrokes and other operator motions, productivity increases of 40% or more are normally expected. The keyboard quality also rises, due to the fewer operator decisions to be made with the simpler keyboards.

## Reduce page make-up costs by producing pages in complete made-up form:

ZIP typesets across the entire page width, regardless of the number of columns on the page, before moving down to the next line level. Computer memory stores all the words for each column and constantly "looks ahead"

to know what material to place in what locations. ZIP enters the page numbers as well as all other changeable or repetitive content, and composes complete, finished pages ready for platemaking.

## Eliminate typemetal storage costs:

Millions of characters are stored in one magnetic tape occupying only a very few cubic feet.

## Reduce costs of updating and filing changes:

Additions and changes are simply "read in" to the computer, to be retained in memory for later use. Keyboarding is simple, and the handling of tangible materials is reduced to a minimum.

## Realize many special benefits of computerization:

1. Alphabetizing or other sequencing of masses of existing data is automated, made faster and more accurate.

2. Re-formatting of existing data into new or different formats and sequences is easily achieved. Tables of contents and indices are automatically calculated and produced. "Bonus" publications are easily obtained.

3. Deadlines are shortened, and reprinting frequencies increased, while decreasing total production time.

4. Proofreading and handling are facilitated, and made more accurate and less expensive.

5. Line drawings and photos, completely programmed as to location in a publication, may be automatically inserted along with word matter in any desired location in the film or paper.

## *ZIP at the National Library of Medicine*

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The first Photon ZIP 900 Phototypesetter was installed in June 1964 in the National Library of Medicine (U.S. Health, Education and Welfare Dept.) in Bethesda, Maryland. Linked to an EDP system called "MEDLARS" (for Medical Library and Retrieval System) this ZIP made possible the world's first fully computerized, production phototypesetting operation.

The Cumulative Index Medicus, a 6,000 page annual listing of medical literature citations, was previously using computer line printer output as the type composition. Produced in the standard print-out form, 10 characters per inch and 6 lines per inch, entirely in typewriter-style capital letters, the pages were photo-reduced to the minimum readable size before printing. Monthly supplements, each comprising a proportionate part of the cumulative yearly book, were produced by the same method.

The effect of ZIP on the appearance and effectiveness of Index Medicus was dramatic. The readability benefits of typesetting, i.e., proportional spacing, changeable fonts, greater word density, and sharper imaging, were obvious.

Even more startling was this realization: The only other way this superior readability could have been obtained would have been by metallic typesetting. But that would have meant running 9 of the fastest tape-driven linecasters (including one for reserve), 3 shifts a day, for six months to do the job. The ZIP did it in two weeks. *ZIP clearly combined the appearance effectiveness of typesetting with the speed and economic advantages of computer print-out.*

It was important that with ZIP the tighter spacing of the typeset characters made each word use less space, shortened the lines, and enabled a whole extra column to be placed on each page. In addition, the lines could be spaced more tightly and more of them put in each column. The net effect of this was to double the word content of each page. This cut the book's bulk in half. Proportionate economies in printing, binding, storage, and mailing, costs of course resulted.

The before-and-after appearance of Index Medicus is seen on the reverse side of this sheet.



# INDEX MEDICUS

FOLIA HERED PATH (MILANO) 12:243-6, JUL 63 (42 REF.) (IT)

## AORTA, THORACIC (A7)

A TECHNIC OF POSTMORTEM ANGIOGRAPHY FOR EVALUATING ARTERIOSCLEROSIS OF THE AORTIC ARCH AND CAROTID AND VERTEBRAL ARTERIES. STEIN BM, ET AL. RADIOLOGY 81:252-6, AUG 63 (MORPHOLOGICAL AND TOPOGRAPHICAL STUDY OF ANEURYSMS OF THE THORACIC AORTA BY TRANSVERSE AXIAL TOMOGRAPHY) ALE G, ET AL. ANN RADIOL DIAGN (BOLOGNA) 36:303-28, 1963 (IT)

## AORTIC ANEURYSM (C8)

CLINICAL PATHOLOGIC CONFERENCE. GLAGOV S, ET AL. AMER HEART J 66:253-62, AUG 63 (SUCCESSFUL RESECTION OF SYPHILITIC ANEURYSM OF AORTIC ARCH. BRADHAM GB, ET AL. ARCH SURG (CHICAGO) 87:521-4, SEP 63 (AN UNUSUAL LEIOMYOMA OF THE ESOPHAGUS. NAJIB A, ET AL. COLL WORKS CARDIOPULM DIS 7:520-3, APR 63 (CLINICOPATHOLOGICAL CONFERENCE XLV. J MISSISSIPPI MED ASS 4:500-3, NOV 63 (DISSECTING ANEURYSM OF THE AORTA. LEVENE A. MED WORLD (LONDON) 99:498-9, OCT 63 (PSEUDOANEURYSM OF ABDOMINAL AORTA. SEIDENBERG B, ET AL. NEW YORK J MED 63:2700-2, 15 SEP 63 (ANGIOGRAPHIC SEMIOLOGY IN MEDIASTINO-PLEURO-PULMONARY SURGERY) CASTANO M. J RADIOL ELECTR 44:529-52, AUG-SEP 63 (FR) (MORPHOLOGICAL AND TOPOGRAPHICAL STUDY OF ANEURYSMS OF THE THORACIC AORTA BY TRANSVERSE AXIAL TOMOGRAPHY) ALE G, ET AL. ANN RADIOL DIAGN (BOLOGNA) 36:303-28, 1963 (IT)

## AORTIC COARCTATION (C8)

AN UNUSUAL CASE OF BACTERIAL ENDOCARDITIS IN AN INFANT WITH CONGENITAL HEART DISEASE. CAYLER GG, ET AL. CALIF MED 99:260-3, OCT 63 (LEFT VENTRICULAR ANGIOCARDIOGRAPHY BY TRANSSEPTAL PUNCTURE OF THE LEFT ATRIUM. BEUREN AJ, ET AL. CIRCULATION 28:209-20, AUG 63 (ANGIOGRAPHIC DETECTION OF COMPLEX COARCTATIONS. IMPORTANCE OF LEFT VENTRICULAR PUNCTURE) SCHLIENG R, ET AL. J RADIOL ELECTR 44:572-83, AUG-SEP 63 (COARCTATION OF THE ABDOMINAL AORTA) GRAMPA G. FOLIA HERED PATH (MILANO) 12:243-6, JUL 63 (IT)

(CONGENITAL PARTIAL ATRIOVENTRICULAR AL. FOLIA HERED PATH (MILANO) (SUBISTHMIC TYPE OF AORTIC CO) REFERENCE TO SURGICAL TREAT JAP J THORAC SURG 16:151-5, 1964 (Fr)

## AORTIC DISEASES (C)

CLINICAL PATHOLOGY 5 Jul 64 (Ger) (AMER HEART J 66:253-62, AUG 63 (PATHOGENESIS OF ANEMIA IN CHRONIC DUE TO VAN M. 9, 18 Jul 64 (Ger) (Med 55:3895-903, 8 Dec 64 (It) (Autopsy of the bone marrow in clinical practice with children with hematologic diseases) Abdullaev KM. Pediatria 43:22-8, Aug 64 (Rus) [Fanconi's congenital aplastic anemia in an 11-year-old girl] Malakhovskii IuE, et al. Pediatria 43:93-4, Aug 64 (Rus) [On technic of bone marrow implantation in children] Mikhailov VG. Pediatria 43:91-2, Aug 64 (Rus) [On the pathogenesis of the hemostatic effect produced by homologous transplantation of freshly prepared bone marrow in aplastic and hypoplastic anemias] Lagutina Nla, et al. Probl Gemat 9:3-8, Aug 64 (Rus) [Manganese in combined therapy of hypoplastic anemia patients] Boiko VA. Ter Arkh 36:104-6, Sep 64 (Rus) [Paralytic leukemia. Chronic anemic type] Ribas-Mundó M, et al. Med Clin (Barc) 43:108-10, Aug 64 (Sp)

## ANEMIA, CONGENITAL HEMOLYTIC (C9, C13)

Congenital hemolytic jaundice corrected by splenectomy followed twenty-six years later by bleeding tendency, hepatomegaly and sudden death. Amer J Med 38:257-67, Feb 65 [Congenital hemolytic anemia with mesobilifuscinuria and inclusion body formation after splenectomy]

PROVINCIAL CARDIO-RHEUMATOLOGICAL CENTER. II.) ROELLA C, ET AL. MINERVA RADIOL 8:297-305, JUL-AUG 63 (IT) (PATHOLOGICAL STUDIES ON EFFECT OF DIETARY MAGNESIUM LEVEL UPON CHOLESTEROL-INDUCED ATHEROSCLEROSIS IN YOUNG RABBITS) HIRAMATSU M. FUKUOKA ACTA MED 54:359-77, MAR 63 (JAP) (EXPERIMENTAL DATA ON FUNCTION OF THE KIDNEYS IN TEMPORARY CONSTRICTION OF THE ABDOMINAL AORTA. PRELIMINARY REPORT) MASTIKA IL. ZDRAVOOKHRANENIE (KISHINEV) 6:32-4, SEP-OCT 63 (RUS) (PULSELESS DISEASE WITHOUT OCCLUSION OF THE SUPRAAORTIC TRUNKS) ALONSO T, ET AL. ANGIOLOGIA 15:316-8, SEP-OCT 63 (SP)

## AORTIC RUPTURE (C8)

AORTIC RUPTURE AFTER A MINOR FALL IN A PATIENT WITH EXTREME CARDIOMEGALY. ARONSON W. JAMA 186:729-30, 16 NOV 63

## AORTIC STENOSIS (C8)

ESSENTIAL FAMILIAL HYPERCHOLESTEROLEMIA AND XANTHOMATOUS HEART DISEASE. SANCHEZ=VALENTI" AL. BOL ASOC MED P RICO 55:359-71, SEP (Fin) (LEFT VENTRICULAR ANGIOCARDIOGRAPHY PUNCTURE OF THE LEFT ATRIUM. P" (Rn infants et al. , Jan 65 (Rus) (CIRCULATION 28:209-20, AUG 63 (Peripheral vascular CALCIFIC EMBOLIZATION ASSOCI Sep-Oct 64 (Sp) (CALCIFIC AORTIC STENOSIS. on-deficiency digestive anemia with (m citrate] Naslo J. (aragoza) 78:438-45, Dec 64 (Sp) (CIRCULATION 28:175-81, (AL. COLL WORKS CARD COMBINED TRICUS" STENOSIS. RF TAVANA M, COLL WOR CONGENIT 64 CORRE" et al. J TH" (Fr)

## A, IDIOPATHIC ACQUIRED

### HEMOLYTIC (C9)

Notes on the relationship between the therapeutic and anticomplementary effects of heparin in acquired hemolytic anemia. Roth KL. Ann Allerg 23:83-92, Feb 65 [Immunological and isotope study of hemolytic anemia with specific "anti-nl" antibodies] Salmon C, et al. Transfusion (Paris) 7:345-55, 1964 (Fr) [Immunohematologic and immunochemical peculiarities in 2 cases of acquired hemolytic anemia] Pagliardi E, et al. Haematologica 49:631-43, 1964 (It) [Autohemolysis test in vitro in immunologic anemia. Influence of splenectomy] Arposio M, et al. Riv Pat Clin 19:575-81, Oct 64 (It) [Behavior of oxygen consumption and anaerobic glycolysis in erythrocytes of patients subjected to splenectomy for immunologic hemolytic anemia] Laboranti F, et al. Riv Pat Clin 19:535-40, Oct 64 (It)

### ANEMIA, MACROCYTIC (C9)

Hereditary orotic aciduria-pyrimidine auxotrophism in man. Smith LH Jr. Amer J Med 38:1-6, Jan 65 [Megaloblastic anaemia in premature infants. Gray OP, et al. Arch Dis Child 40:53-6, Feb 65] The direct antiglobulin (Coombs) test in megaloblastic anaemia. Forshaw J, et al. J Clin Path 18:119-20, Jan 65 [Iron resistant anemias of pregnancy. Geary WL, et al. J Louisiana Med Soc 117:79-82, Mar 65] Jejunal diverticulosis, megaloblastic anaemia and partial gastric atrophy. Kerr GD, et al. Postgrad Med J 41:43-7, Jan 65 [Folic acid deficiency in patients after gastric resection. Gough KR, et al. Quart J Med 34:1-14, Jan 65] [The hyperkinetic circulatory state]. Bäckman H. Duodecim 80:1060-4, 1964 (Fin)

### ANEMIA, PERNICIOUS (C9, C13)

Intestinal distribution of intrinsic factor and vitamin B12 absorption. Okuda K, et al. Amer J Physiol 208:14-7, Jan 65 [Chronic erythrocytic hypoplasia following pernicious anemia. Goldstein C, et al. Blood 25:31-6, Jan 65] Studies on human gastric intrinsic factor: observations on its possible absorption and entero-hepatic circulation. Ardeman S, et al. Brit J Haemat 11:1-4, Jan 65 [Studies on hemoglobin biosynthesis: asynchronous synthesis of hemoglobin A and hemoglobin A2 by erythrocyte precursors. Rieder RF, et al. J Clin Invest 44:42-50, Jan 65] The early appearing bilirubin: evidence for two components. Yamamoto T, et al. J Clin Invest 44:31-41, Jan 65 [Dialysis assay for intrinsic factor and its antibody: demonstration of species specificity of antibodies to human and hog intrinsic factor. Ramsey C, et al. J Lab Clin Med 65:143-52, Jan 65] A comparison of autoimmune phenomena in pernicious anemia and chronic atrophic gastritis. Fisher JM, et al. New Eng J Med 272:499-503, 11 Mar 65

### ANEMIA, HYPOCHROMIC (C9)

Sideropenic dysphagia in a patient with ulcerative colitis. Wright R. Amer J Med 38:274-8, Feb 65 [Excess hemolysis in subjects with severe iron deficiency anemia associated and nonassociated with hookworm infection. Layrisse M, et al. Blood 25:73-91, Jan 65] Studies on desferrioxamine in relation to the absorption of iron. Bannerman RM, et al. Brit J Haemat 11:15-20, Jan 65 [Familial pyridoxine-responsive anaemia. Bourne MS, et al. Brit J Haemat 11:1-10, Jan 65] Experimental sideroblastic anaemia. Harriss EB, et al. Brit J Haemat 11:99-106, Jan 65 [Hereditary sideroblastic anaemia. Losowsky MS, et al. Brit J Haemat 11:70-85, Jan 65] Hookworm studies in Tanganyika. Investigations at Machui in the Tanga Region. Sturrock RF. E Afr Med J 41:520-9, Nov 64 [Observations on some aspects of iron deficiency anaemia. Chatterjee JB. J Ass Physicians India 13:13-22, Jan 65] [Pyridoxine responsive anaemia. A review. Lele RD. J Ass Physicians India 13:27-32, Jan 65]



Nedwidek Wm J 80 Brewstr ———— GI 7-7336  
 Nedworney P Mrs 18 Mada Av ———— GI 7-1125  
 Nedza Chas J 35 Silvr Lk Rd ———— YU 1-0652  
 Nee John 1 David Pl ———— SA 7-4719  
 Needham Chester T 33 Cntrl Av ———— GI 7-8442  
 Needham's Motor Svce Inc  
 187 Meadow Rd Rutherford N J NYC# BR 9-5450  
 Needleman Max 450 Falcn Av ———— YU 7-0941  
 Neelen Edw 8 Sneed ———— YU 4-2897  
 Neelen J C 381 Chevs Av ———— GI 2-1277  
 Neelen's Hrdwr 10 Sneed ———— YU 4-1244  
 Neely David 48 Larkn ———— YU 1-8725  
 Neely Ruth H Mrs 6 De Grt Pl ———— GI 7-3553  
 Neenan Cornelius F 193 Morisn Av ———— GI 8-3185  
 Neenan John H 71 Hlnd Av ———— GI 2-7889  
 Neenan Mary Mrs 154 S St Austns Pl ———— GI 8-2966  
 Neergaard Olaf C 46 Old Amby Rd ———— YU 4-7283  
 Neergaard Pharmacies 454 S Av Bklyn ———— SO 8-0600  
 Neeson Patk 151 Pottv Av ———— GI 8-2200  
 Neetz Carl 277 Grt Kls Rd ———— YU 4-6807  
 Negas Geo 123 Presct Av ———— EL 1-9411  
 Negedly Geo W 38 Bayrd ———— FL 6-1669  
 Negedly Wm G 24 Lamnt Av ———— YU 4-0660  
 Neglia Jos 51 Hikry Av ———— GI 7-1875  
 Neglia P 288 Cromwl Av ———— EL 1-1198  
 Negliaccio Mary Mrs 205 Windsr Rd ———— SA 7-7542  
 Negovan Agnes Mrs 66 Tmpkns ———— SA 7-9270  
 Negri Dominick 175 Vn Nme Av ———— GI 7-7837  
 Negri John 50 Coursn Pl ———— SA 7-4564  
 Negron Michl A 340 Vn Nme Av ———— YU 1-9075  
 Neher E K 4 Chstr Pl ———— YU 1-9752  
 Neher Wm 105 Wilsn ———— EL 1-2341  
 Neiczky Mary 32 Prsct Pl ———— EL 1-5940  
**NEIDLEIN BLDG INC** 52 Elmdw Av ———— YU 4-8858  
 Neil Crane Rentl Corp 151 Morngrstr Rd ———— 273-1890  
 Neil Helen M 71 8 St ———— EL 1-7320  
 Neil John T 91 Beach Av ———— EL 1-5359  
 Neil Sarah S Mrs 191 Sinclair Av ———— YU 4-0261  
 Neill Supl Co Inc wrght stl pipe  
 700 Schuyler Av Lyndhurst N J NYC# RA 9-3000  
 Neilson Eliz 253 Hecker ———— YU 4-2792  
 Neilson Harold 50 Wall ———— YU 1-8954  
 Neisner Bros Inc varity stor 1399 Forst Av ———— GI 8-8070  
 Neitzel Richd H 148 Wardwl Av ———— GI 2-2519  
 Nelkin Plating Cos Inc Thel  
 345 Ten Eyk Bklyn EM 6-5000  
 Nelley H E 71 Chrstphr ———— SA 7-1314  
 Nellis Arthur Sr 368 Victry Blvd ———— SA 7-1830  
 Nellis Arthur C 167 Carol Pl ———— YU 1-4496  
 Nellis B W 700 Victry Blvd ———— GI 7-0020  
 Nellis Herbert L 235 Wstwd Av ———— SA 7-6394  
 Nellis Reginald V 131 Jerisy ———— 442-7949  
 Nellis Rodney S 339 Vndrbt Av ———— SA 7-5072  
 Nelsen B C 71 Elmira Av ———— SA 7-2628  
 Nelsen B R 39 Maine Av ———— GI 2-4711  
 Nelsen Chas 25 Alvine Av ———— YU 4-5774  
 Nelsen Geo A 208 Pacif Av ———— YU 4-9546  
 Nelsen John K 40 Snea Av ———— YU 1-8381  
 Nelsen Nels 376 Neal Dw Av ———— SA 7-6753  
 Nelsen Nels H 19 Gregg Pl ———— GI 8-6046  
 Nelsen Norman 95 Brwn Av ———— GI 8-2651  
 Nelsen Norman R 182 Castltn Av ———— AR 3-1122  
 Nelsen Odd P 48 Veltmn Av ———— AR 3-1719

**NELSON—See Also NIELSEN, NILSEN**

Nelson Adam C T 22 York Av ———— GI 8-8926  
 Nelson Adolf 228 Nichlas Av ———— GI 8-7489  
 Nelson Agnes 101 Danl Low Ter ———— 981-2544  
 Nelson Albert F 60 Faber ———— YU 1-7994  
 Nelson Alice Mrs 52 Brook ———— SA 7-4746  
 Nelson Alice R 138 Hagmn Pl ———— GI 8-3932  
 Nelson Allan J 25 Grntwd Av ———— FL 6-0682  
 Nelson Allan T 188 Justn Av ———— EL 1-6282  
 Nelson Anna M Mrs 115 Lexgtn Av ———— SA 7-1165  
 Nelson Archie R 283 St Pauls Av ———— GI 2-5898  
 Nelson Arnold E 60 Exetr ———— YU 4-6899  
 Nelson Arthur Jr physthrpst 556 Coleg Av ———— GI 8-8123  
 Nelson Arthur Mr 22 Pershg ———— 981-5136  
 Nelson Arthur C 76 Brtha Pl ———— YU 1-0110  
 Nelson Arthur C 212 Rice Av ———— GI 2-3645  
 Nelson Arthur J 275 Decker Av ———— GI 8-0412  
 Nelson Arthur J 72 Drake Av ———— GI 2-1364  
 Nelson Arvid 46 Vn Burn ———— SA 7-7125  
 Nelson August B 3737 Hylan Blvd ———— YU 4-6728  
 Nelson Bros rfg & siding 495 Anadl Rd ———— YU 4-7924  
 Nelson C F 119 Lathrp Av ———— GI 2-0594  
 Nelson Chester E 63 Almd ———— YU 4-1381  
 Nelson Clarence 81 Dtroit Av ———— YU 4-4071  
 Nelson Donald N 442 Sycmor ———— YU 4-2447  
 Nelson E 188 Justn Av ———— EL 1-7328  
 Nelson Edgar E 10 Jaksn ———— GI 7-5843  
 Nelson Edwin R 15 Bayrd ———— YU 4-0436  
 Nelson Emily C Mrs 365 Baden Pl ———— EL 1-2362  
 Nelson Eric H 105 9 St ———— EL 1-8428  
 Nelson Francis V 210 Gnsvrt Blvd ———— GI 7-0437  
 Nelson Frank J 27 Hatfld Pl ———— SA 7-4940  
 Nelson Freightways Inc  
 12 Dock Mt Vern ———— 914 MO 4-4488  
 Nelson G H Miss nrs 137 Wilobr Rd ———— GI 2-7922  
 Nelson Geo C 54 Wst Terrace ———— YU 4-2159  
 Nelson Guilborg Mrs 174 Lewlyn Pl ———— GI 7-1258  
 Nelson Gustav 87 Taft Av ———— GI 7-0838  
 Nelson Harold L 55 Austn Pl ———— GI 7-3325  
 Nelson Harry 101 Whelr Av ———— GI 7-7350  
 Nelson Helen M Mrs 2 Cnter ———— EL 1-1528

Nelson Henry E 101 Danl Low Ter ———— 981-2544  
 Nelson Herman 762 Seavv Av ———— EL 1-1440  
 Nelson Irving 282 Poiln Av ———— YU 4-3176  
 Nelson Jas P 319 Bway ———— GI 8-5554  
 Nelson Janice 40 Snea Av ———— GI 8-4812  
 Nelson John 122 Lamprtt Blvd ———— YU 1-4068  
 Nelson John B 77 Harisn Av ———— GI 2-0451  
 Nelson John E 26 Fldwy Av ———— 984-9488  
 Nelson John F 7720 Amboy Rd ———— YU 4-3219  
 Nelson John J 342 Brysn Av ———— GI 2-7817  
 Nelson John K 177 Wooly Av ———— GI 2-2948  
 Nelson John R 413 Hebrtn Av ———— GI 2-6576  
 Nelson John T 127 Corsn Av ———— GI 8-3863  
**NELSON JOS E** engr 42 Richmnd Ter ———— GI 7-7920  
 Nelson Jos P 950 Sinclair Av ———— YU 4-0545  
 Nelson Junius 44 Main ———— YU 4-1684  
 Nelson Katherine 146 Bidwl Av ———— 447-0305  
 Nelson Kenneth W 282 Dgls Rd ———— SA 7-2387  
 Nelson Knud 65 Du Bois Av ———— GI 8-4091  
 Nelson Kurt 24 Shmidt's Av ———— GI 2-5053  
 Nelson Lawrence Jr 317 Rudyrd ———— YU 7-1328  
 Nelson Louis B 11 Coale Av ———— YU 1-0498  
 Nelson Marie Mrs 29 Hatfld Pl ———— GI 2-2296  
 Nelson Martin B 139 Regan Av ———— SA 7-4659  
 Nelson Mary 21 Pearl ———— SA 7-3852  
 Nelson Mary J Mrs 71 Lamprtt Blvd ———— YU 1-2972  
 Nelson Maurice K 55 Austn Pl ———— YU 1-9692  
 Nelson Mildred 81 Dtroit Av ———— YU 4-4071  
 Nelson Nels 68 Coale Av ———— GI 8-8958  
 Nelson Nels 68 Marx ———— GI 2-9025  
 Nelson Nels Victor 7 Nash Ct ———— YU 4-5798  
 Nelson Norman 435 Delafld Av ———— GI 8-5446  
 Nelson Norman I 53 Mildrd Av ———— GI 2-0342  
 Nelson Oscar C Mrs 93 Hamln Pl ———— SA 7-4685  
 Nelson Otto S 418 Ws Ardn Rd ———— YU 4-8758  
 Nelson Patk 53 Grant Pl ———— EL 1-5825  
 Nelson Paul 222 Rathbn Av ———— YU 4-0462  
 Nelson Ralph 381 Harld Av ———— YU 4-0720  
 Nelson Ralph E 1479 Forst Av ———— GI 7-1899  
 Nelson Robt A 284 Londn Rd ———— EL 1-5678  
 Nelson Robt C 516 Rathbn Av ———— YU 4-0345  
 Nelson Robt L 36 Constnt Av ———— GI 2-4952  
 Nelson Robt P 29 Idaho Av ———— YU 4-5527  
 Nelson Roy C 452 Clark Av ———— YU 7-3874  
 Nelson Russell G 1609 Castltn Av ———— GI 7-3335  
 Nelson Russell M 95 Circl Rd ———— YU 7-0950  
 Nelson Stanley 96 Sawyr Av ———— GI 2-2666  
 Nelson Ter Inc caters 23A Nelsn Av ———— 984-9811  
 Nelson Theresa 19 Rokwl Av ———— GI 2-5016  
 Nelson Thos A 21 Strattfrd Rd ———— SA 7-0223  
 Nelson Thos P 527 Craig Av ———— YU 4-1210  
 Nelson Wallace 647 Coleg Av ———— GI 2-1399  
 Nelson Wayne M Jr 161 Wardwl Av ———— YU 1-9068  
 Nelson Wilfred B 79 Bodin ———— GI 2-0409  
 Nelson Wm 68 Wldnd Av ———— FL 6-0559  
 Nelson Wm J Rev 161 Campbl Av ———— YU 1-4429  
 Nelson Wm L Sr 61 Mada Av ———— GI 8-5014  
 Nelting Harold 1759 Victry Blvd ———— GI 8-9571  
 Nembhard Benj 385 Cary Av ———— GI 8-2348  
 Nemecek Andrew T 181 Gordn ———— 273-0447  
 Nemecek Eugene M 204 Shmidt's La ———— GI 7-1331  
 Nemecek Jos 415 Britn Av ———— SA 7-6768  
 Nemeth Andrew 1083 N R R Av ———— EL 1-8344  
 Nemeth John E 2662 Amboy Rd ———— YU 7-4652  
 Nemeth Jos 2910 Arthr KI Rd ———— YU 4-3045  
 Nemeth Jos 2910 Arthr KI Rd ———— YU 4-3293  
 Nemeth Jos J 258 Poltny ———— EL 1-4299  
 Nemeth Steve 114 Kreishr ———— YU 4-3244  
 Nemfakos P S Dr 800 Victry Blvd ———— SA 7-6214  
 Nenashew Peter 5 Winthrp Pl ———— GI 2-0410  
 Nepo Norman 850 Howrd Av ———— 727-9692  
 Nepo Orazio 191 Dongn ———— SA 7-2060  
 Nepo Theresa Mrs 171 Katan Av ———— YU 4-8121  
 Nepola Nello MD 217 Rose Av ———— EL 1-1294  
 Nepomuceno Antonio C 101 Laurl Av ———— YU 1-8304  
 Nepp V Mrs 1657 Richmnd Av ———— GI 2-6415  
 Nerenberg A 194 Trgee ———— SA 7-7723  
 Nerenberg Helen N Mrs 64 Beekmn ———— SA 7-4327  
 Neri A Inc 1034 Clinton Hoboken N J ———— NYC# W0 2-2086  
 Neri Eugene G 37 Arlo Rd ———— GI 2-8721  
 Neri Frank 25 Hull Av ———— EL 1-5988  
 Neri Hugo A 99 Sprng ———— GI 8-2489  
 Neri Jos J 42 Mill Rd ———— EL 1-9055  
 Nerlino Alfred P 293 Simnsn Av ———— YU 1-5540  
 Nerlino E Geo 1830 Forst Av ———— GI 8-8228  
 Nerlino Henry 219 Colfld Av ———— GI 7-2934  
 Nerlino Michl J 39 Summr Av ———— GI 8-7347  
 Nerlino Salvatore G 51 Hudsn Pl ———— GI 8-1890  
 Nerlino V M 228 Colfld Av ———— YU 1-1725  
 Nersten Arthur K 253 Crystl Av ———— GI 7-3521  
 Nervig Robt M Rev 557 Bard Av ———— GI 2-3125  
 Nervo John 8 Hasbrk Rd ———— YU 7-1230  
 Nervo Thos 10 Hasbrk Rd ———— YU 7-0549  
 Nesbitt Chas 12 Lenox Pl ———— SA 7-6018  
 Nesbitt Joshua 106 Eliz ———— AR 3-0696  
 Nesco Steel Barrel Co  
 1130 Elizabeth Av W Linden N J NYC# BA 7-4695  
 Nescott Of S I cosmetics 2239 Forst Av ———— YU 1-6803  
 Nesel Walter 60 Plsnt Plns Av ———— YU 4-4435  
 Nesse Floyd 190 Wilard Av ———— SA 7-9882  
 Nesso I 34 Cromwl Av ———— EL 1-1455  
 Nesso L 40 Cromwl Av ———— EL 1-8052  
 Nestel Eliz A 152 Bidwl Av ———— SA 7-2502  
 Nestel Wm C 167 Dikie Av ———— GI 8-9626  
 Nesti Anthony J 48 Rugls ———— YU 4-4082  
 Nesvold Hans K 20 Montel ———— SA 7-1173

Nesvold Herbert 6 Berwn La ———— GI 2-1751  
 Nesvold Peter 653 Cary Av ———— GI 2-3558  
 Netreba Frank restrnt 70 Osgood Av ———— 447-9734  
 Netreba Geo H 68 Osgood Av ———— SA 7-1980  
 Netreba Nicholas Mrs 183 Pine Pl ———— GI 7-7953  
**NETTEE'S FASHNS** 445 Castltn Av ———— YU 1-0612  
 Netterman Esther Mrs 181 Gordn ———— YU 1-8711  
 Netti Paul 32 Lambtr's La ———— GI 8-4378  
 Netti Peter F 147 Union Av ———— SA 7-5747  
 Nettles Silas 263 Davis Av ———— GI 8-4806  
 Nettleton Robt F 392 Shirly Av ———— FL 6-0125  
 Neu Chas 44 Hilsid Ter ———— YU 4-8169  
 Neu Donald 168 Herefrd ———— FL 6-0589  
 Neubauer Andrew 17 Hamln Pl ———— GI 8-0281  
 Neubauer Edw 215 Van Plt Av ———— GI 8-4995  
 Neubauer Norman 156 Alter Av ———— YU 7-5634  
 Neube Alex 29 Seavr Av ———— YU 7-0162  
 Neubeck Jacob 83 Colon Av ———— YU 4-0147  
 Neuberger Jerome M 14 Merik Av ———— GI 2-7178  
 Neuberger Jerome M lwy 350 St Marks Pl ———— GI 7-1243  
 Neubert Geo W 344 Maine Av ———— YU 1-7137  
 Neubert Gustav 55 Somers La ———— GI 7-7986  
 Neubert R 800 Victry Blvd ———— GI 2-5866  
 Neubourg Danl 20 Univ Pl ———— SA 7-6132  
 Neubourg M 226 Ward Av ———— GI 7-2761  
 Neuert Allison A Mrs 11 Birch Av ———— GI 7-3675  
 Neuert Martha F Miss 6322 Amboy Rd ———— FL 6-1070  
 Neuguth Rosemarie J Mrs 2018 N R R Av ———— YU 7-1434  
 Neuls Robt W 433 Delafld Av ———— GI 8-8717  
 Neuman Geo W Mrs 151 Danl Low Ter ———— GI 7-0706  
 Neuman Kennard R 15 Mundy Av ———— GI 8-0562  
 Neuman Robt W 36 Medo Av ———— GI 8-8429  
 Neumann B W 45 Catln Av ———— SA 7-0943  
 Neumann Chas 43A Ebits ———— YU 7-2295  
 Neumann Doris 247 Nugnt ———— 987-0712  
 Neumann E J 735 Edggrv Av ———— YU 4-2768  
 Neumann Frank J 175 Grt Kls Rd ———— YU 4-8456  
 Neumann Hermann 91 Leeds ———— EL 1-2931  
 Neumann Isidor 751 Jewet Av ———— SA 7-5120  
 Neumann Jos 36 Elicot Pl ———— GI 7-7766  
 Neumann Otto 42A Scribnr Av ———— GI 2-8236  
 Neumann Richd 503 Wilobr Rd ———— SA 7-7918  
 Neumann Walter F 123 Irmine Dr ———— EL 1-1134  
 Neumann Walter T 247 Nugnt ———— 987-0712  
**NEUMANN'S HOSRY SHOP INC**  
 205 Richmnd Av GI 2-6621  
 Neumeister Chas 62 Katan Av ———— YU 4-6933  
 Neumeister David 62 Katan Av ———— YU 4-6933  
 Neumeister Richd C 66 Wiman Av ———— YU 4-5787  
 Neumiller Geo J 65 Hilsid Ter ———— YU 4-7823  
 Neumuller Ernest 200 Evgrn Av ———— EL 1-8993  
 Neumuller Henry 70 Lynhr Av ———— GI 7-2930  
 Neusch H 551 Delafld Av ———— GI 8-6635  
 Neusch R 18 Harnd Av ———— GI 2-8577  
 Neuschaefer Fred R 357 Bdfrd Av ———— EL 1-6581  
 Neuschaefer Waldine M Mrs 385 Rarintn Av ———— YU 7-4141  
 Neustadter John L 49 Seacrst Av ———— YU 4-9427  
 Neuzil Eugene H 87 Cathrn ———— GI 2-6728  
 Neve Muriel Hall gift shp 817 Castltn Av ———— GI 2-6189  
 Neve Patk L 151 Jerisy ———— YU 1-5130  
 Neve Rinaldo Geo 126 Harvrd Av ———— GI 8-5322  
 Neves Raymond 78 Spansh Colny ———— YU 4-5210  
 Nevi Mario 63 Ovrlk Av ———— EL 1-0426  
 Neville Geo E 490 Hebrtn Av ———— YU 1-5589  
 Neville Harry F 8 Clov Lk Pl ———— GI 8-8716  
 Neville Richd S 90 Hrbr Vw Pl ———— GI 7-0663  
 Neville S 148 Bard Av ———— 448-6388  
 Neville Thos F 2 Hardy ———— GI 8-9821  
 Neville Wm H 53 Dongn Av ———— GI 8-9356  
 Nevins Dorothy M Mrs 134 Keegns La ———— FL 6-1125  
 Nevins Harold J 1636 Castltn Av ———— 448-2270  
 Nevins John J Sr 576 Tysns La ———— EL 1-7378  
 Nevius Chloe Y 33 Cntrl Av ———— SA 7-8007  
 New Amsterdam Casualty Co 100 Wm Manh ———— HA 2-5050  
 New Boro Electrcl Co 191 Vn Duzr ———— 448-3366  
 New Blvd Pool & Day Camp  
 1325 Kennedy Blvd Bayonne N J ———— 201 HE 7-3434  
**NEW BRIGHTON PLUMBING CO INC**  
 49 Longvrv Rd GI 2-7322  
**NEW BRIGHTON—SI SAVINGS & LOAN ASSN—**  
 Branches—  
 741 Castltn Av ———— GI 2-0366  
 1 Hyatt ———— GI 8-8800  
 St Geo Term ———— GI 8-8800  
 St Geo Term ———— GI 8-8899  
 New Columbia Meat Mkt 174 St Marys Av ———— SA 7-1618  
 New Deal Auto Parts 351 Tmpkns Av ———— GI 7-5995  
**NEW DEAL AUTO WRECKING**  
 351 Tmpkns Av GI 7-5995  
 New Dorp Aquarium & Pet Cntr  
 293 Nw Drp La EL 1-4883  
 New Dorp Bapt Church 46 10 ———— YU 7-1164  
 New Dorp Bar & Grill 91 Nw Drp Plz ———— 351-9717  
 New Dorp Coal Corp 1352 N R R Av ———— EL 1-1100

At its normal speed of 2.37  
 nine-inch lines a second,  
 ZIP produced this completely  
 made-up page in 46 seconds.





## MECHANICAL OPTICAL AND DATA HANDLING DESCRIPTION

# Photon ZIP 901 High Speed Computer Phototypesetter

## Components

The Photon 900 system is divided into three (3) units: Photo Unit, Control Unit and Tape Handler, the first two of which are seen above. The upper section of the Photo Unit contains all the optical and photographic elements, enclosed in a sheet metal housing with doors or panels all around. The lower section of the Photo Unit contains the electronic assemblies required to control the photography. The Control Unit houses the control panel as well as tape format translator, memory, arithmetic section, logic control section, and confidence check section. The control panel is mounted in the top of the Control Unit. The rest of the section is mounted below the counter in rack type construction, with access to the front and back via hinged doors. All mechanical and optical components are assembled on a sturdy tubular base to assure stability and accuracy.

The Tape Handler (not furnished by Photon) must be a standard 6-bit magnetic tape unit, commercially available, for off-line operation.

## Basic Operation

The images of all the characters are contained in a stationary matrix, a glass negative.

There are 11 rows of master characters of 24 characters each, for a total capacity of 264 characters on the matrix. Each of the characters of the stationary matrix is provided with individual flash illumination. Character images are reproduced on photo film or paper by a lens traversing constantly back and forth between two fixed positions in such a manner that the entire film width is swept. A memory storage system and controlling circuits produce timing for the illumination of individual characters. The position of the character in the glass matrix and its relative position in the line being composed are taken into account by calculation.

## Optical System

Associated with each character in the matrix plate is an individual light source consisting of a flash lamp operated by the discharge of a condenser which is triggered by a pulse generated at the appropriate instant by solid-state electronics. A lens is positioned between the matrix and the film so that at any instant it can make an image on the film of all characters in the matrix. The lens is mounted on a carriage which reciprocates between two extreme positions. A full line is created in each traverse by firing the appropriate combination of lamps.

The displacement of the film for line spacing occurs during the reversal of the lens movement - it is accomplished in less than 90 milliseconds. A grid attached to the lens carriage, an optical system, and a photocell generates a timing pulse for each unit displacement of the carriage. The width unit in the machine is one-eighteenth of the six point EM. The width of all the characters is measured by a discrete number of units.

The ZIP optical system provides high reliability, precise positioning of character images and superior image quality - these results occur from the use of large, perfectly formed, undistorted master characters, straight optics, and extremely short duration flashes. Basically, the Photographic Unit will perform in the same way as the standard Photon machines where photocell pulses, identical flash lamps, and similar lens carriages are used.

## Film Magazine Assembly

The film handling unit consists of a film magazine with two cassettes each with a capacity of 100 feet of film or paper. Line spacing is achieved by a motor-driven mechanism comprised of a series of rollers. The portion of the film receiving the image of the line is held flat against a pressure plate by proper formation of the film loop. Loading and unloading the machine requires less than two (2) minutes.



## Solid-State Hardware

The output typesetter storage, logic and control functions are all implemented with solid state devices. The entire construction is on a modular basis, facilitating maintenance.

### Information Transfer (Load/Calculate Mode)

Upon command from the control console, the tape transport reads one line of data. As each character is read into the control console, a parity check is performed. If parity does not check, the control console will automatically back the tape to the beginning of the line and attempt a second read-in. If the parity fails again the unit will come to a stop and a parity error indicator will illuminate. If parity checks, the unit will ignore the first parity error and continue on reading on that line.

Each line has been previously justified in the computer by the insertion of fixed spaces. As each character is read from tape its flash position is calculated. Each character is used as the address to a reference table of character rank and width. The reference tables are stored in a portion of the memory. For each character, its width is added to all subsequent character widths in that line in the width accumulator, and an accumulative width is added to the rank position of that character. This number is the index position of that character in the line and is then stored along with the character code in the memory as one word. All words are stored in sequence in the memory in the order in which they come from the tape and the order that they will appear on the printed page. Characters are however not exposed on the film in the same order in which they will appear on the printed page, but are exposed on the film in accordance with their print position in the line plus a delay, or position shift, equal to the rank position in the character matrix. In this manner when during the normal printing mode a block of characters representing one printed line is taken from the tape its absolute sequence of exposure to the film is calculated and stored with a character code in the memory.

### Index Mode

Upon completion of the Load/Calculate mode the index mode begins its sorting routine. The characters along with their respective flash positions are stored in the order in which they will appear on the printed page. They are now arranged in the order they will be flashed.

The memory consists of 22-bit per word, 2048-word memory. The data including the sort technique uses 1024 words of the memory which is split into 4 segments of 256 words each. The data is initially stored in segment 1 and also segment 2 if more than 256 characters are loaded. The first character, along with its flash position, is read from memory. The least significant bit of the flash position is checked to see if it is a binary "ONE" or "ZERO". If it is a "zero", it is stored in the first address of segment three. If it is a "one" it is stored in the first degree of segment four. The character code is always carried with the flash position and stored as a 21-bit word. All of the data is read out and sorted into its respective segments. After all flash position bits are sorted, all the character codes, with their flash positions, will be in the order in which they will be flashed.

The location of the characters in the line to be composed depends not only on the location of the characters in the alphabet, but also on the space occupied by all the preceeding characters in the line, or the preceding characters and justifying spaces. Consequently, in order to determine the time at

which any character should be projected onto the film it is necessary to add the character's rank value (expressed in units) to the sum of all preceeding character widths and justified spaces, if any, (also expressed in units).

The sum of these values, called flash position number, or index number, determines the time at which a character must be flashed. It is evident that characters are not flashed in the sequence in which they are read. For example, the line "SAMPLE OF COMPOSITION" is formed in the following flash sequence = A, E, C, F, M, I, P, S, O, I, L, M, O, O, P, N, O, S, T.

### Transcribe Mode

After the completion of the index operation, the control of the unit is returned to the main control and the system is now ready for the transcribing mode (film exposure). As a mechanical system drives the lens carriage back and forth, lens position pulses are generated by an optical decoder which also senses the "start" and "stop" range of the lens (the exposing range of the film). When the lens passes out of the active area, the lens position pulse starts the loading mode. This is followed by the flash positions calculation and subsequently the flash position indexing. Then the unit is dormant until the lens position pulse is received on the return swing of the lens to initiate the transcribing mode. The same type of operation is repeated as the lens completes its travel through the active area, and the other lens position pulses are obtained to start a new loading mode, calculation mode, and flash position indexing. The receipt of the start lens position pulse of that line again starts the transcribing mode. Note that the transcribing mode occurs with either direction of motion of the lens. This is accomplished by utilizing a reversible access memory. The memory can be sequenced in its address from either high to low or low to high.

An accumulator counts the lens position pulses. The first character, with its flash position, is read out of memory into a register. After each lens position pulse is added to the accumulator, a comparison is performed with the flash position of the character. If they compare, the character register activates the lines to the photo unit for flashing, the character is held in the register until a flash echo is received to verify that it did flash. If an echo is not received, the process stops and waits until the lens is in position for a second attempt. If it does flash on second attempt, printing continues in the normal mode. If it does not flash on the second attempt the unit will stop printing and a flash error indicator lamp on the control panel will be illuminated. If two or more characters have the same flash position when a flash has been verified by the echo, the next character is immediately read into the register and compared with the lens position counter. Up to four characters may be flashed in this manner and have the placement of the characters stay within tolerances.

### Confidence Check

There are two (2) basic check points in this system. One (1) is a parity check on the input codes, and the other is a system self-check capability. In order to provide information on the performance of flash lamps, the equipment will electrically sense the flashing of a lamp. When a flash command is given it will be compared to the output of the detector to see if a lamp, any lamp, has been flashed. If no flash occurs, an error will be indicated. Also, if a flash should occur at any time without the command having been given, an error signal will be operated.



# PHOTON MODEL 901 ZIP COMPUTER-PHOTOTYPESETTER

## OPERATING SPEEDS AT VARYING LINE LENGTHS:

At 11" line — 2.15 lines/second  
At 10" line — 2.25 lines/second

9" — 2.37  
8" — 2.49

7" — 2.64  
6" — 2.80

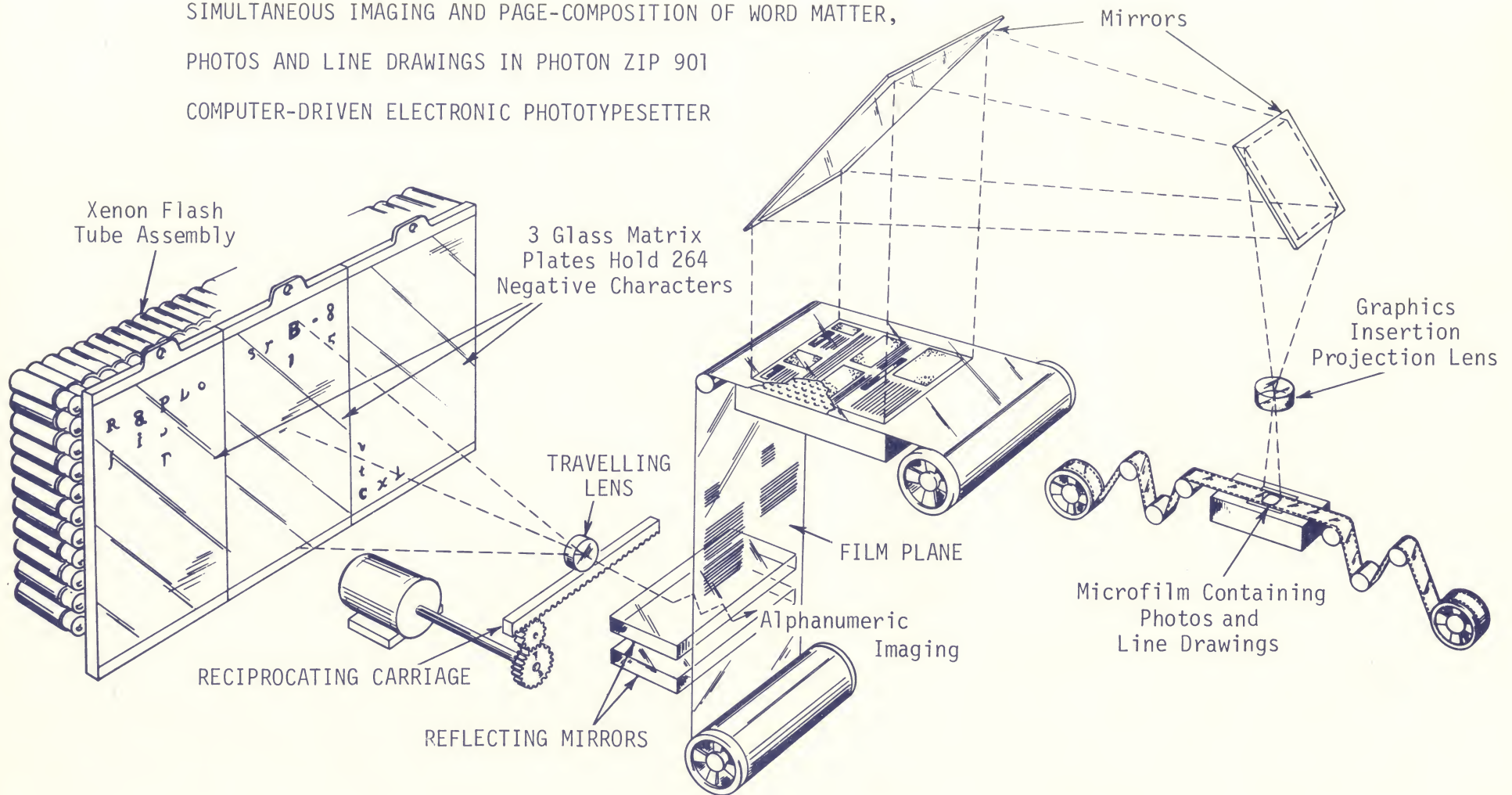
5" — 2.98  
4" — 3.19

## PRODUCTION SPEEDS IN SPECIFIC APPLICATIONS:

DESCRIPTION OF JOB (Setting completely made-up pages in every case)	TYPE SIZE BEING SET	AVERAGE LOWER CASE CHARACTER COUNT PER INCH	LINE LENGTH IN INCHES	CHARACTERS PER LINE	SPEED IN LINES PER SEC.	SPEED IN CHARACTERS PER SEC.	LINES PER PAGE	PRODUCTION TIME PER PAGE
Setting 12" x 13" telephone directory (daily addenda) pages, size to size.	7 pt.	22 (with Bell Gothic type face)	10.5"	231	2.15 (11" Lens traverse)	497	$\frac{125 \text{ Lines}}{(73 \text{ pica depth, 7 pt. leading})}$	58 Sec.
Setting 8 1/2 x 11" industrial parts listing pages, size to size.	7 pt.	30 (with Univers Medium Condensed)	7.25"	218	2.49 (8" Lens traverse)	541	$\frac{84 \text{ Lines}}{(56 \text{ pica depth, 8 pt. leading})}$	34 Sec.
Setting misc. pages undersize, for enlargement to 8 1/2 x 11" before pr'tg.	4 pt. on 4 1/2 (for 70% enlargement to 6.8 pt. on 7.65)	51 (with Univers Medium Condensed)	4.5"	230	2.98 (5" Lens traverse)	690	$\frac{90 \text{ Lines}}{(58 \text{ pica depth, 7.65 pt. leading})}$	30 Sec.
Setting 2 pages side by side, under size, for enlargement before printing.	4 pt. on 4 1/2 (for 150% enlargement to 10 on 11 1/4)	51 (with Univers Medium Condensed)	6.5" (Two 2.9 Lines)	296	2.64 (7" Lens traverse)	781*	$\frac{60 \text{ Lines}}{(56 \text{ pica depth, 11.25 pt. leading})}$	23 Sec.

\*Still higher characters-per-second speeds can be produced by using a smaller type size or more condensed face.

SIMULTANEOUS IMAGING AND PAGE-COMPOSITION OF WORD MATTER,  
PHOTOS AND LINE DRAWINGS IN PHOTON ZIP 901  
COMPUTER-DRIVEN ELECTRONIC PHOTOTYPESETTER



The ZIP Graphics-Insertion Attachment automatically projects illustrations onto the film while it is in the magazine prior to typesetting exposure. A special 105 mm microfilm camera and a projection mechanism in the ZIP magazine are employed.

The camera accomplishes four steps: It photographically reduces and stores each graphic on 105 mm film; it places each graphic in its relative proper place on the page via a special light grid projected on the copyboard; it converts the graphic to the proper relative size; and it screens the graphic for halftone illustrations.

Projection (with approximate 3 times enlargement) takes place during a single pass of the ZIP lens and does not interfere in any way with the alphanumeric print-out function. The projection strobe light is triggered by a begin-page code. The computer provides for the graphics during its pagination routine.

The system will store up to 250 page formats and will project any page up to 11 1/2 x 14 inches. Any format can be positioned automatically or manually. The film drive provides selection and inspection via a manual control which transports the film in either direction for viewing the formats on a viewing screen. The automatic selection advances each format in sequential order.



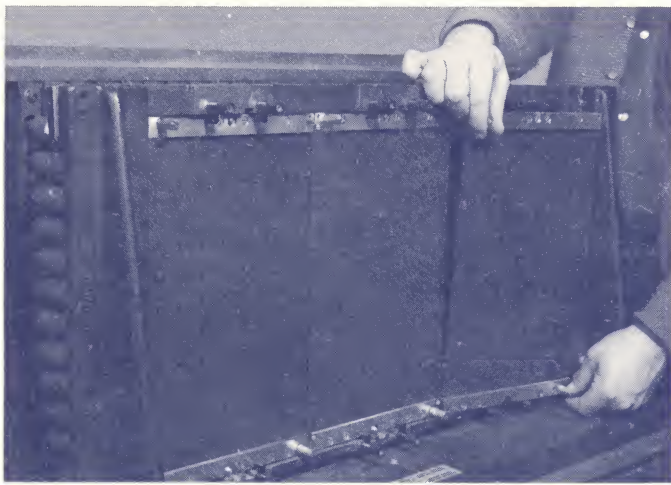


FIGURE 5. ZIP MATRIX ASSEMBLY

### PRODUCTIVITY IN CHARACTERS PER SECOND

Varies according to type style and size and line length. Example: at 30 (6 point) characters per inch and 2.37 (9 inch) lines a sec., the composing rate is  $30 \times 9 \times 2.37$ , or 640 characters a second. Speeds above 750 a sec. are achieved by use of tighter fitting type faces or smaller type sizes photo-enlarged before printing.

### LINE SPACING

The leading or line spacing is by one-quarter ( $1/4$ ) point increments, two (2) point increments or multiples thereof. Leading will take place during the end of line turnaround of the lens travel. Leading can be varied from line to line.

### MAGAZINE UNITS

Supply and take-up cassettes are designed to accommodate one hundred twenty (120) feet long and up to twelve inches (12") wide phototypesetting film or paper. The copy is right reading positive, emulsion up.

### RANK AND WIDTH TABLES

The tables are stored in a portion of the memory. They are loaded via magnetic tape. The tables assign a rank and width value for each character plus a marker bit and OP code.

### POWER REQUIREMENTS

Nominally, 208/120 V, 3-phase, 60 cycle AC, 20 amps per phase.

### DIMENSIONS

Control Unit: 60" high, 48" deep, 32" wide

Photo Unit: 57" high, 96" deep, 44" wide

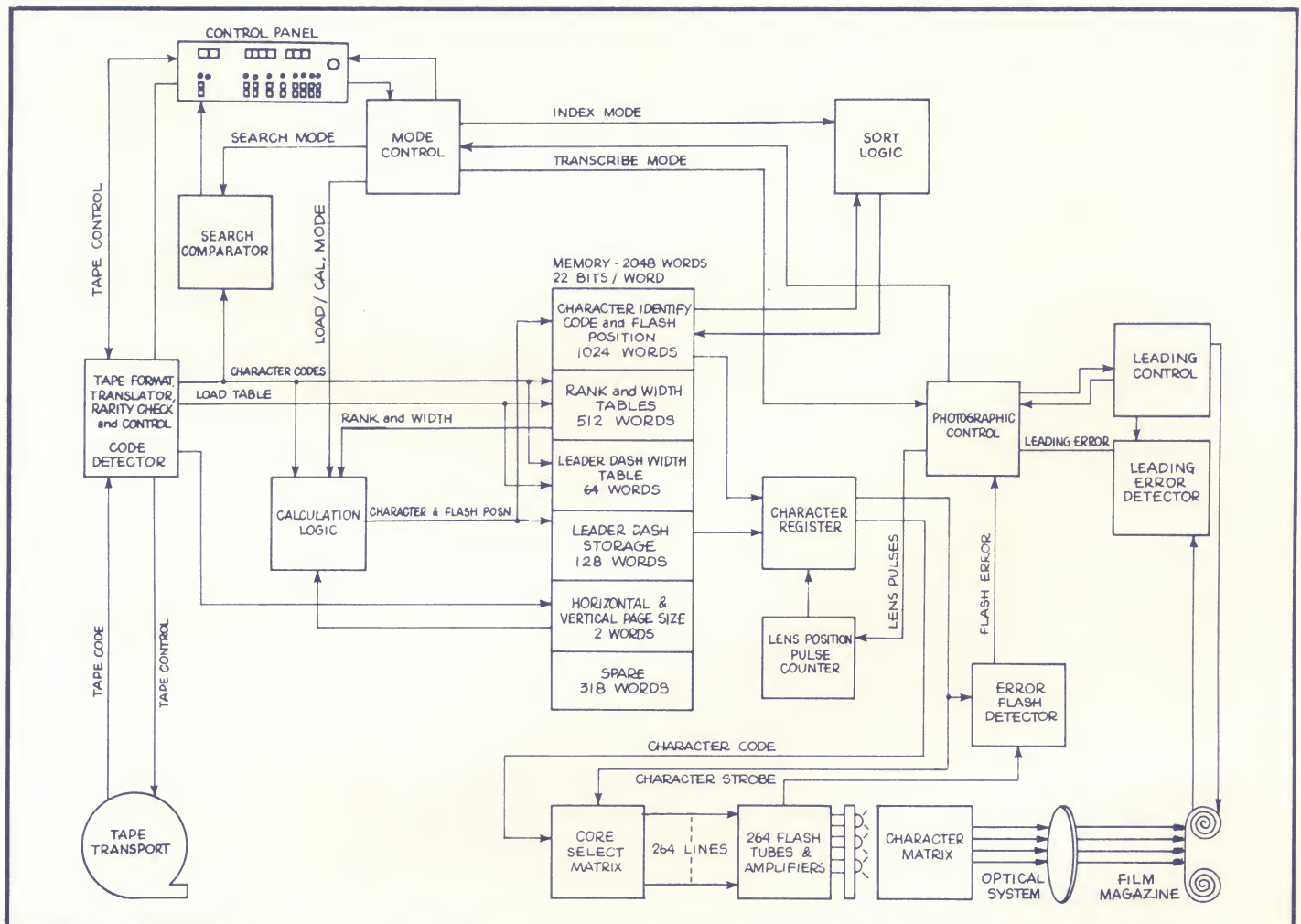


FIGURE 6. ZIP BLOCK DIAGRAM

## CONTROL AND OPERATION

### Control Panel Indicators and Switches

#### Indicating Micro Switches

On/Off	Back One Gap
Print/Stop	Manual Lead
Search	Tape Rewind
One Page	Alarm Reset
One Line	Audible Alarm Reset
Forward One Gap	Load Table

#### Indicators

Stand-By  
Check Valid  
End of Data  
Operable

#### Alarm Indicators

Low Film/No Film  
No Flash/Extra Flash  
Parity  
Power  
Line Justification  
Page Justification  
Illegal Character  
Interlock  
Leading

#### Selection Switches (Manual)

Report Number (two decimal digits)  
Page Number (four decimal digits)  
Line Number (four decimal digits)  
Two Leading Switches (1/4 point and 1 point)

#### Numerical Display

Report Number (two decimal digits)  
Page Number (four decimal digits)  
Line Number (four decimal digits)  
Check Number (three octal digits)

#### Tape Format

First block on every input magnetic tape will be an initialization control message consisting of

Start line code  
ICB Identifier code  
Size of horizontal sweep  
Size of vertical page  
End of line code

#### Data Block Format

First 10 characters computer calculation control block

Report Number  
Page Number  
Line Number

then follows 9-bit code made up of 6-bit character information codes and 3-bit shift codes.

#### Lens Position Pulses

3651 pulse positions (in 11" line)

#### Reciprocating Carriage

Linear Speed 37.3"/second

#### Leading and Calculation

(Turnaround) 60 to 100 ms

### Magazine

Leading Motor – capable of 200 steps/rev or 100 steps/sec., 10 ms/step.

### Unit

One elementary unit or basic horizontal unit 1/18 of a 6 pt. EM = .00461 inches.  
24 vertical rows separated by 55 units – called rank.

### Flash Duration

Approx. 3 microseconds

### Elementary Rank Value

Reference line of first character and reference line of next character 55 units.

### Firing Positions

Rank value & the sum of previously accumulated character widths.

### Lens

Goertz Microtar 45 lines/mm

### TEMPERATURE REQUIREMENTS

A temperature of from 62°F to 84°F and relative humidity of 50% (+10%) shall be maintained at all times under full equipment load. When the equipment power is off temperature shall be maintained between 50°F and 110°F and relative humidity between 0% and 80%.

The following tolerances will apply where adequate photographic conditions and controls are maintained.

### Character Resolution

not less than 36 lines per mm.

### Character Density

value of 3.0 plus or minus 10 percent. Clear areas transmit a minimum of 95 percent white light.

### Horizontal Tolerances

between the reference points of adjacent characters within plus or minus .001 inches.

### Baseline Tolerances

located vertically on adjacent characters within plus or minus .001 inches.

### Leading Tolerances

between the baselines of any two consecutive lines which are not separated more than .125 within plus or minus .001 inches of leading increment specified.

**PHOTON**  
NEWSMAKER IN PHOTOTYPESETTING

355 MIDDLESEX AVENUE  
WILMINGTON, MASSACHUSETTS